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SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

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I. ASTRONOMY

1. Structure of the Sun

"The Structure of the Sun," by A. G. Masevich and T. G. Volkonskaya, State Astronomical Institute imeni Shternberg, Computer Center, Moscow State University; Moscow, Astronomicheskiy Zhurnal, Vol 36, No 1, Jan/Feb 60, pp 42-50

"A new model for the Sun has been computed with the help of the electronic computer "Strela" of Moscow University. The model consists of three parts, differing in chemical composition: (1) an outer envelope with no energy sources in it; the mean molecular weight of this layer μ_1 is at the same time the initial chemical composition of the model; (2) an intermediate layer in which the proton-proton reaction operates while the contribution of the carbon cycle is still negligible; (3) a central part in which the energy output is determined simultaneously by both the carbon cycle and the p-p reaction.

"No mixing is assumed to occur between the different parts of the model. No supposition is made in advance about any of the three parts being in convective or radiative equilibrium. Numerical integration of the model is performed from the surface to the interior and every step tested for possible convective instability. The absorption law is taken in the form: $k = \frac{1}{t} k_o \frac{\rho}{T^{3.5}} + 0.30 (1 + X)$ with $k_o = 3.9 \cdot 10^{25} \times (1 + X) (1 - X-Y) + 4.1 \cdot 10^{22} (1 + X) (X + Y)$. The correction factor t is taken from Morse's tables. The attempt to construct an initial homogeneous model for values of $L_\odot$, $M_\odot$, $R_\odot$ equaling those of the Sun ($L_\odot$, $M_\odot$, $R_\odot$) was altogether unsuccessful. For $r = 0$, a simultaneous approach of L and M to zero could be achieved only for values of $X > 1$, i.e., for a "negative" helium content. We carried out a calculation for the chemical composition derived by P. Naur for his model N 1 of the Sun ($X = 0.74$, $Y = 0.25$, $Z = 0.0075$) and obtained a table very similar to that given by Naur with the difference that $M = 0$ for $r \neq 0$ and $L \neq 0$.

"A finished homogeneous model could be obtained only with $M = M_\odot$ $R = R_\odot$, $L = 0.85 L_\odot$ with $X = 0.995$, $Y = 0.003$ and $Z = 0.002$. This model has a small convective core ($M_{core} = 0.068 M_\odot$, $R_{core} = 0.107 R_{core}$). For all the other parts, radiative equilibrium remains stable. The central values of temperature and density for this model are $T_c = 12.07^\circ$ K, $\rho_c = 89$ g/cm^3. The upper boundary of the intermediate zone where the p-p reaction operates is at $r = 0.63 R_\odot$.

"The energy source of the model is the p-p reaction. Even inside the core, the contribution of the carbon cycle is moderate.

"At present, the construction of an evolutionary sequence of inhomogeneous models for $M = M_{\odot}$ is being carried out for determining the structure and age of the present Sun."

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II. CHEMISTRY

Fuels and Propellants

2. Conversion of $CaO_2.2H_2O_2$ Into $Ca(O_2)_2$

"On the Mechanism of the Conversion of the $CaO_2.2H_2O_2$ Into $Ca(O_2)_2$," by I. I. Vol'nov and V. N. Chamova, Laboratory of Peroxide Compounds, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 3, Mar 60, pp 522-523

It was established that if $CaO_2.8H_2O$ does not contain mother liquor hydrogen peroxide, its decomposition does not lead to the formation of $Ca(O_2)_2$. Formation of $Ca(O_2)_2$ with the highest yield takes place when the compound $CaO_2.2H_2O_2$ is decomposed. Under favorable conditions comprising a temperature of 50°, high vacuum, and spreading of the material in a thin layer, formation of $Ca(O_2)_2$ from $CaO_2.2H_2O_2$ takes place according to a reaction which can be expressed by the equation

$$2\ (CaO_2.2H_2O_2) \rightarrow Ca(O_2)_2 + Ca(OH)_2 + 3\ H_2O + 1.5\ O_2$$

3. Thermochemistry of Hydrogen Superoxide and the Radical HO_2

"On the Higher Hydrogen Peroxide and Frozen Radicals; Part 2 -- Some Notes on the Thermochemistry of the Higher Peroxide H_2O_4 and the Radical HO_2," by I. I. Skorokhodov, L. I. Nekrasov, L. A. Reznitskiy, K. G. Khomyakov, and N. I. Kobozev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 33, No 9, Sep 59, pp 2090-2095.

The results of a calorimetric investigation of the process of thermal decomposition of the solid condensate obtained by freezing out at the temperature of liquid nitrogen water vapor subjected to the action of an electric discharge were published earlier (cf L. A. Reznitskiy, K. G. Khomyakov, L. I. Nekrasov, and I. I. Skorokhodtsev, Zhurnal Fizicheskoy Khimii, Vol 32, 1958, p 87). The solid condensate is a mixture of water, hydrogen peroxide, the compound H_2O_4, and frozen HO_2 radicals.

Investigation of the condensate by the method of electronic paramagnetic resonance indicated that the content of HO_2 radicals in it is low, amounting to approximately 0.3% by weight.[2] It follows from this that the original explanation of the exothermic effect accompanying evolution of 30% of the total quantity of oxygen was incorrect: this effect represents a sum of the heat effects of reactions (1) and (2) combined with the heat evolved because of the crystallization of the amorphous part of the condensate.

$$HO_2 + HO_2 \rightarrow H_2O_2 \text{ (solid)} + O_2 \qquad (1)$$

$$H_2O_4 \text{ (liquid)} \rightarrow H_2O_2 \text{ (liquid)} + O_2 \qquad (2)$$

The quantity of oxygen evolved by reaction (1) cannot comprise more than 4% of the total amount of gas developed in the decomposition.

Taking this into consideration, the experimental data pertaining to heats of decomposition of the solid condensate formed at minus 196° were subjected to more detailed analysis. It was established that the heat effect of the liquid phase decomposition of H_2O_4 into O_2 and H_2O_2 amounts to ΔH = minus 39 kilocalories per mol. From the experimentally determined magnitude of the exothermal effect corresponding to the first stage of the decomposition of the condensate (up to minus 70°), the heat of crystallization of the amorphous part of the condensate has been calculated. The value obtained was ΔH = minus 2.6 kilocalories per mol of H_2O_2, which is close to the heat of fusion of H_2O_2. For this reason it is assumed that the devitrification of the condensate is directly connected with a change in the state of the hydrogen peroxide present in it. From the heat of decomposition of the compound H_2O_4 to O_2 and H_2O_2, the heat of formation of H_2O_4 from the elements (ΔH = minus 6 kilocalories per mol) and the heat of recombination of HO_2 radicals to H_2O_4 (ΔH = minus 15 kilocalories per mol of H_2O_4) have been computed. The values obtained are in good agreement with other thermochemical data.

The thermochemical data obtained agree best with the structure H - O - O - O - O - H for hydrogen superoxide. Calculation of the bond energies of this compound shows that the energy of the central O - O bond lies within the range of 11-43 kilocalories, provided that the other bonds are analogous to the corresponding bonds of the hydrogen peroxide molecule.

4. Publication of Second Edition of Book on Separating Gas Mixtures by Cooling to Very Low Temperatures

Spavochnik po Razdeleniyu Gazovykh Smesey Metodom Glubokogo Okhlazhdeniya (Manual on the Separation of Gas Mixtures by the Method of Cooling to Very Low Temperatures), 2d ed, 25 standard printed sheets, 10,000 copies, price 13 rubles 50 kopecks (unsigned review of book to be published by Goskhimizdat in 1960); Moscow, Khimicheskaya Promyshlennost', No 7, Oct/Nov 59, p 644

This manual gives the principal physicochemical constants, data on phase equilibria, and information on the behavior of different substances at low temperatures, and also the parameters necessary for the calculation and design of industrial gas separation installations. Particular attention is paid to hydrocarbons and mixtures of hydrocarbons. The book will serve the needs of workers active in the field of separation of gas mixtures. It may also serve as a textbook for aspirants and students who specialize in industrial applications of cryogenics.

5. Effects of Pressure and Temperature on Propagation of Flames

"Concerning the Chain-Thermal Propagation of Flame; Part 2 -- The Effects of Pressure and Temperature," by L. A. Lovachev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 2, Feb 60, pp 204-210

In Part 1 of this investigation (Izvestiya Akademii Nauk SSR, Otdeleniye Khimicheskikh Nauk, 1959, p 1740) a relationship was derived for determining the velocity of flame propagation in a system in which a chain reaction assumed to proceed according to a simplified scheme is taking place. This relationship was arrived at by analyzing the equations of heat conductivity and of the diffusion of the active center. In Part 2 of the investigation, which is reported in this instance, a relationship is established between the velocity of flame propagation, the pressure, and the temperature. It follows from this relationship that the rate of change in the flame propagation velocity depends on the composition of the combustible mixture, its heating value, and the initial temperature. In mixtures with a high heating value the rate of flame propagation may be independent of the pressure.

The theoretical relations pertaining to the dependence of the velocity of flame propagation on pressure for a stoichiometric methane-air mixture and for ethylene-air mixtures of different composition, which have been calculated on the basis of the relationship derived, are in satisfactory agreement with experimental data.

The slope of the curve expressing the dependence of the velocity of flame propagation on the inverse temperature of combustion was found to depend not only on the activation energy, but also on the heat of the reaction leading to the formation of an active center. The relationship established makes it possible to determine the true activation energy by analyzing experimental data.

6. Changes in Composition of Radicals and Effect of Radicals on Velocity of Chain Reactions

"Changes in the Composition of Radicals During Complex Chain Reactions," by Ye. T. Denisov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 2, Feb 60, pp 195-203

In complex chain reactions which proceed with the formation of intermediate molecular products, the composition of radicals must necessarily change in the course of the reaction because of changes in the composition of the products. In the work reported at present, a general solution is given of the problem concerning changes in the velocity of a complex chain reaction which take place by reason of changes in the composition of radicals. The case of a reaction with several active centers is considered. Appearance of more active radicals may increase the velocity of the reaction by a small whole multiple, whereas the appearance of radicals with a low activity may inhibit the reaction to a great extent. Radicals which react with each other slowly increase the velocity of the reaction by a small whole multiple, while radicals which react with each other rapidly may slow it down considerably.

7. Relation Between Sensitivity to Impact and Flash Temperature of Explosives

"The Relation Between Sensitivity to Impact and the Flash Temperature of Explosives," by L. G. Bolkhovitinov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 2, Feb 60, p 476

In work done earlier by the author the assumption was made that the maximum temperature developing in a solid explosive upon impact is limited by the melting temperature of the explosive, which in turn depends

on the pressure. To generate a focus with a temperature T, one must apply to the layer of explosive a pressure amounting to $p \sim T\text{-}T_{melting}$, when $T > T_{melting}$ (L. G. Blokhovitinov, Doklady Akademii Nauk SSSR, Vol 125, 1959, p 570). The mean diameter of hot foci which form as a result of an impact depends on the degree of dispersion (mean particle size) of the solid explosive. When the explosives are tested on an impact [falling weight] device under the same conditions, the pressure which develops as a result of the impact is proportional to the square root of the initial energy of the load that is applied, i. e. $P \sim \sqrt{E} \cdot (T_{flash} - T_{melting}) / \sqrt{E}$ have a constant value for all substances if the flash temperature has been determined under the same conditions and E represents an impact energy at which there is the same probability of an explosion for every substance (it is obvious that the absolute value of the constant depends on the conditions under which T_{flash} and E have been determined). To check whether or not the ratio given above has a constant value, flash temperatures and impact energies at which 50% of the samples explode, based on data published by Ya. I. Leytman and applying to 21 substances, were employed (Leytman, Voprosy Teorii Vzryvchatykh Veshchestv (Problems of the Theory of Explosives), Vol 1, Publishing House of the Academy of Sciences USSR, pp 134-144). Plotting of $T_{flash} - T_{melting}$ against E for these substances indicated that the expected relation between the flash temperature and the sensitivity to impact of explosive substances actually exists.

The fact that the existence of this relation was established indicates that objections which have been raised against the thermal theory of sensitivity are invalid and also confirms the correctness of the assumption made earlier by the author in regard to the role which pressure plays in the initiation of explosions by impact.

8. Reaction Burner for Cutting Stone, Rocks, and Concrete

"A Reaction Stream Cuts Stone" (unsigned dispatch); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 144 (599), 9 Dec 59, p 4

In work done under the direction of Prof A. V. Brichkin at the Kazakh Mining and Metallurgical Institute, a new device has been developed for the drilling, cutting, and working of the strongest types of rock and concrete. The rocks disintegrate under the action of the

high-temperature gas stream ejected at supersonic velocity from the nozzle of the reaction burner. Application of the thermal cutting device accelerates the working of the hardest granites by a factor of 10-12 as compared with the methods used hitherto. The cost of stone for the facing of buildings is lowered by a factor of 6-7 when the new device is used. Application of the new device makes it possible to drill blast holes and other holes to a depth of 3-3.5 meters.

Industrial Chemistry

9. Synthesis of Isotactic Polymethylmethacrylate by Polymerization of Frozen Monomer in Presence of Magnesium

"Synthesis of Isotactic Polymethylmethacrylate by Polymerization of the Frozen Monomer," by V. A. Kargin, V. A. Kabanov, and V. P. Zubov, Chemistry Faculty, Moscow State University; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 2, No 2, Feb 60, pp 303-305

It was established in earlier work done by the authors (Vysokomolekulyarnyye Soyedineniya, Vol 1, 1959, p 265; Vol 1, 1959, p 1859) that methyl methacrylate and a number of other monomers are capable of undergoing polymerization in the solid state after being condensed in vacuum together with magnesium vapor on a solid surface cooled with liquid nitrogen. Polymerization in the frozen molecular mixture begins at a temperature of the order of minus 100-110°, i.e., at a point considerably lower than the melting point of methyl methacrylate (m p = minus 50°), and proceeds at an extremely high velocity (if the heat is not conducted away rapidly enough, polymerization may take place with the velocity of an explosion).

Investigation of the properties of the polymethylmethacrylate prepared in this manner indicated that it is a homogeneous polymer not containing any free magnesium. The quantity of bound magnesium contained in it did not exceed 0.5% by weight. The polymer was found to dissolve in toluene and dichloroethane, forming transparent solutions. It retained the bound magnesium on being reprecipitated from solutions.

The characteristics of the polymer obtained were found to correspond in every respect to those of isotactic polymethylmethacrylate synthesized by polymerizing methyl methacrylate in nonpolar solvents in the presence of alkyl lithium. One may conclude from this that the polymer which forms as a result of the polymerization of the frozen monomer is also isotactic polymethylmethacrylate.

It was established by the method of electronic paramagnetic resonance that polymerization under the conditions mentioned above proceeds by a radical mechanism (cf earlier publications by the authors). Work done by T. G. Fox and others led to the conclusion that low-temperature homogeneous radical polymerization of methyl methacrylate results in the formation of the syndiotactic polymer only, the configuration of this polymer being more favorable from the energy standpoint. During the low-temperature polymerization of frozen polymethylmethacrylate in a system produced by the molecular beam method, the preliminary ordering which takes place in the solid monomer phase exerts a considerable influence on the thermodynamic conditions under which the polymer chains grow. In other words, the packing of molecules of the monomer in the solid phase contributes to the formation of an isotactic microstructure of the polymer chains.

10. Publication of Book on Fluorine Plastics Announced by Goskhimizdat

Ftoroplasty (Fluorine Plastics), by D. L. Chegodayev, 10 standard printed sheets, 25,000 copies, price 5 rubles (unsigned review of book to be published by Goskhimizdat in 1960); Moscow, Khimicheskaya Promyshlennost', No 7, Oct/Nov 59, p 644

This book gives data on the mechanical, chemical, and technological properties of fluorine plastics and also on methods for their conversion and industrial application. The book is designed for engineers and technical and scientific workers and also for persons engaged in designing equipment for the chemical, refrigeration, foodstuffs, pharmaceutical, electrical, and radio engineering industries.

11. Translation of Czech Book on Fluoro-Organic Compounds To Be Published by Goskhimizdat

Khimiya Ftoroorganicheskikh Soyedineniy (The Chemistry of Fluoro-Organic Compounds), translation from the Czech under the editorship of Academician I. L. Knunyants, 25 standard printed sheets, 5,000 copies, price 14 rubles (unsigned preview of book to be published by Goskhimizdat in 1960); Moscow, Khimicheskaya Promyshlennost', No 7, Oct/Nov 59, p 643

This is a monograph on the chemistry of fluoro-organic compounds which subjects to detailed treatment questions pertaining to the terminology of such compounds and gives data on methods for the synthesis of

the principal types of fluoro-organic compounds and materials and equipment used in work with them. Fluorinating agents are also discussed. A detailed description is given of the physical and chemical properties of fluoro-organic compounds, of methods for their analysis, and of the applications of these compounds.

This book is of great interest to a wide circle of organic chemists and also to persons active in the plastics industry and at enterprises which produce or apply refrigerating fluids.

Inorganic Chemistry

12. Work on Reactions With High-Pressure Gases Conducted at Institute of General and Inorganic Chemistry, Academy of Sciences USSR

"Application of Gases at Elevated Pressures for the Synthesis of New Inorganic Compounds," by V. G. Tronev, Doctor of Chemical Sciences, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Priroda, Vol 48, No 10, Oct 59, pp 89-91.

At the Laboratory of High Pressures of the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR, work is conducted on the application of high-pressure gases in the synthesis of inorganic compounds. New methods are being developed for the preparation of pure metals, coordination compounds of rare elements, etc. Processes of oxidation with highly compressed oxygen of inorganic compounds in complex, so-called conjugated systems are being investigated with the purpose of synthesizing new compounds at the lowest possible temperature.

Among the syntheses which have been carried out by using high-pressure gases, one may mention preparation of very pure metals or compounds in which elements with an unusual state of valency are present by applying hydrogen under high pressure. V. G. Tronev, A. S. Kotel'nikova, and G. K. Babeshkina applied high-pressure hydrogen to reduce perrhenates, obtaining chlororhenates of tetravalent and divalent rhenium. Many new coordination compounds of rare elements (e.g., selenium, tellurium, gallium, indium, thallium) have been synthesized by A. N. Grigorovich and A. P. Kochetkova, who successfully used ammonia at

elevated pressures for the ammonation of salts and for the preparation of otherwise thermally stable complexes which are unstable in aqueous solutions and therefore cannot be synthesized in such solutions. Using high-pressure gases in combination with nonaqueous organic solvents, one can synthesize hitherto unknown mixed complex amino compounds of a predetermined composition from elements in different valency states.

Extensive possibilities exist for the application of oxygen under high pressure to carry out new oxidation reactions in inorganic chemistry and technology. Some examples are processes (which have been carried out only on a laboratory scale hitherto) to synthesize from sulfur and selenium in anhydrous liquid ammonia sulfamine and selenoamino compounds by subjecting the sulfur and selenium to the action of high-pressure oxygen.

In work carried out by V. G. Tronev, together with V. N. Chulkov and A. L. Khrenova, it was established that when high pressure is applied, the interaction of sulfur, selenium, and liquid ammonia with oxygen takes place with a high velocity at room temperature. The sulfur is converted into a water soluble sulfamino compound. By employing a process of this type, one can produce without expending any energy for heating a valuable product which can be used as a fertilizer of the ammonium sulfate type. Selenium under the same conditions behaves differently from sulfur and can thus be separated completely from that element.

It has been established that ammonia can be oxidized with oxygen in the presence of sulfur, selenium, and some metals to the corresponding nitrates at the relatively low temperatures of 50-100°C if high-pressure oxygen is applied. By interacting metallic silver with oxygen under pressure in the presence of liquid ammonia, one can synthesize silver nitrate mixed with ammonium nitrate and by reacting selenium under the same conditions, imidodiselenamate mixed with ammonium nitrate. Conjugated reactions of this type, which apparently proceed by a chain mechanism under the formation of free radicals and take place at relatively low temperatures, have been observed earlier in the work described in cases when coordination compounds of some metals were reduced by applying hydrogen under elevated pressure.

The possibilities of applying conjugated reactions with high-pressure gases for the synthesis of inorganic compounds and the development of new technological processes have not yet been exhausted; much that is new will presumably be found in further work in this field.

13. Oxidation of Sulfur by Oxygen Under Pressure in Presence of Ammonia

"Oxidation of Sulfur by Oxygen Under Pressure in the Presence of Liquid Ammonia," by V. G. Tronev, V. N. Chulkov, and A. L. Khrenova, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 11, Nov 59, pp 2046-2048

It was established that elemental sulfur can be oxidized at room temperature by oxygen under pressure in the presence of anhydrous liquid ammonia. Under the conditions applied, neither sulfur nor ammonia reacts with oxygen when present alone. The products of the reaction, which is exothermic and rapid, are distinct from those formed by SO_2 and NH_3 or SO_3 and NH_3. The over-all composition of the reaction products corresponds to the formula $4\ SO_2 \cdot 5\ NH_3$.

Nuclear Fuels and Reactor Construction Materials

14. Synthesis of Sulfate of Tetravalent Uranium by Reduction With Rongalite

"Synthesis of the Sulfate of Tetravalent Uranium by Means of Rongalite," by L. I. Yevteyev and G. I. Petrzhak; Leningrad; Radiokhimiya, Vol 1, No 5, Oct 59, pp 581-582

A method has been developed for the preparation of $U(SO_4)_2 \cdot 4\ H_2O$ by reduction of uranyl nitrate with rongalite.

15. Uranium Content in Petroleum

"On the Uranium Content in Petroleum," by R. K. Alekperov and H. Kh. Efendiyev, Institute of Chemistry, Academy of Sciences Azerbaydzhan SSR; Moscow, Geokhimiya, No 6, 1959, pp 513-517

The uranium content was determined in petroleums of some Azerbaydzhan deposits bound to different series of tertiary sediments. The uranium determination was carried out in petroleum ash with the aid of the luminescence method. It was found that:

(1) Uranium is a component of all the studied petroleums. The uranium amount varies in them from 1×10^{-4} to 5×10^{-2} % in the ash or from 1×10^{-7} to 5×10^{-3} g/l of petroleum.

(2) The uranium content and the ash content of petroleums are in inverse proportion; this indicates that the uranium is bound to the organic petroleum components.

(3) The character of uranium distribution in the system petroleum-bed water depends on the chemical composition of the latter. In the above-mentioned system the equilibrium is always shifted towards the petroleum. This is more pronounced in the case of hard water.

(4) It was established that the uranium amount being extracted by petroleum from artificial solutions decreases in conformity with the following series of salts contained in solutions: $CaCl_2$ - $MgCl_2$ - NaCl - $NaHCO_3$.

16. Experiment in Biogeochemical Prospecting and Methods for Niobium Determination in Plants

"Experiment in Biogeochemical Prospecting and Methods for Niobium Determination in Plants," by N. A. Tyutina, V. B. Aleskovskiy, and P. I. Vasil'yev, Leningrad Technological Institute imeni Lensovet; Moscow, Geokhimiya, No 6, 1959, pp 550-554

An increase of the niobium content in plants from 0-3 µg to 50-70 µg (per g of dry plant material) may serve as an indication for search in geological prospecting work.

It is found that in the region under examination Rubus arcticus L, Chamaenerium augustifolium L., Baccinium myrtillulus L., and Rubus chamaemorus L. show great ability for niobium extraction from the soil.

Methods for the determination of niobium, both from ash and from dried plant material, are worked out.

17. Formation of Complex Compound of Uranyl Ion With 8-Hydroxyquinoline

"Formation of a Complex Compound of the Uranyl Ion With 8-Hydroxyquinoline," by M. T. Pavlovskaya and I. M. Reybel', Chair of Inorganic Chemistry, Kishinev Agricultural Institute; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 393-395

The quantitative determination of uranyl with 8-hydroxyquinoline in a 70% alcohol solution in the presence of an excess of pyridine was investigated. The minimum quantity which can be detected and the limiting dilution were determined. The composition of the complex compound formed by uranyl with 8-hydroxyquinoline in the presence of 2.66 mols of acetic acid and of an excess of pyridine was found to correspond to a 1:1 ratio between UO_2^{2+} and 8-hydroxyquinoline.

18. Improved Method of Depositing Layers of U and Th Using Electric Field

"Improvement of the Deposition of Layers of Uranium and Thorium by the Method of Dispersion in an Electric Field," by Yu. A. Selitskiy; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 554-555

A method used for the deposition of thin layers of uranium and thorium on metal foils and organic films involves dispersion of an aqueous solution of nitrate and subsequent treatment of the metal nitrate deposited on the support. The films deposited in this manner are not sufficiently uniform. It was established that the lack of uniformity is caused by hygrosopicity of the nitrate. To improve the uniformity, a method has been developed whereby dispersion and deposition of the nitrate is alternated with heating of the deposited salt. Under these conditions the hygroscopicity is eliminated.

19. Method for Photocolorometric Determination of Thorium With Thoron II

"Rapid Photometric Determination of Thorium With the Thoron II Reagent," by V. I. Kuznetsov and S. B. Savvin; Leningrad, Radiokhimiya, Vol 1, No 5, Oct 59, pp 583-588

A rapid method is described for the determination of microquantities of thorium present in the form of ThO_2. The procedure in question involves the use of the new organic reagent thoron II. To suppress reactions of other elements, the determination is conducted in a strongly acidic medium in the presence of oxalic acid, which binds Zr, Hf, and Ti.

20. Basic Chlorides and Hydroxides of Yttrium and Lanthanum

"Basic Chlorides and Hydroxides of Yttrium and Lanthanum," by N. V. Aksel'rud and V. B. Spivakovskiy, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 327-339

The composition and ionic activity products of a number of basic chlorides and hydroxides of lanthanum and yttrium were determined. The aging of these compounds as it affects their composition and ionic activity products was studied.

21. Investigation of Yttrium Complexes by Ion-Exchange Method

"Application of Ion-Exchange to the Investigation of the State in Which Substances Occur in Solutions; Part 7 -- Investigation of Complexes Formed by Yttrium with Monobasic Acids," by V. I. Paramonova, A. S. Kereychuk, and V. A. Shishlyakov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 650-659

A method is proposed for the calculation of dissociation constants in systems which form simultaneously several charged complexes. The formation of complexes by yttrium-91 with acetic acid was investigated. It was established that the complexes YAc^{2+} and YAc_2^+ are formed in the range of acetic acid concentrations below 0.2 N. The magnitude of the over-all concentration dissociation constants of these two complexes was established at an ionic strength equal to 0.2. The constants were found to be equal to 3.8×10^{-2} and 1.5×10^{-3}, respectively. Formation of complexes by yttrium-91 with the lactate ion was investigated. It was established that the complex $YLact^{2+}$ is formed at an ionic strength amounting to 0.2. This complex has a dissociation constant equal to 2.7×10^{-3}.

Taking into consideration the presence of the first of the two complexes, a more precise value for the over-all dissociation constant of $YLact_2^+$ was found. It was established that this constant is equal to 2.0×10^{-5} rather than 1.1×10^{-5}, which is the value determined in earlier work. It was found that the process of complex formation in lactic acid solutions depends not only on the concentration of the free additive, but also on that of undissociated lactic acid. This presumably is due to the effect exerted by hydroxy groups of the lactic acid.

22. Basic Chlorides and Hydroxide of Dysprosium

"The Basic Chlorides and Hydroxide of Dysprosium," by N. V. Aksel'rud and V. B. Spivakovskiy, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 348-355

The composition, ionic activity products, and isobar-isothermic potentials of formation of the basic chlorides and hydroxide of dysprosium that form in the system $Dy^{3+} - OH^- - Cl^- - H_2O$ at 25° were determined.

23. Carbonates of Trivalent Cerium

"Investigation of the Composition and Properties of the Carbonate Compounds of Trivalent Cerium," by Su Ch'ang and Shih I-i, Institute of Applied Chemistry, Academy of Sciences of the People's Republic of China (Ch'ang-ch'un); Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 372-380

The carbonates and complex carbonates formed in the system $Me_2CO_3 - Ce(NO_3)_3 - H_2O$, where Me = Li, Na, K, or NH_4, were investigated at 25° by the methods of solubility measurements, determination of the pH, measurements of electrical conductivity, and determination of changes in the apparent volume of the precipitates formed. A knowledge of the complex carbonates formed by rare-earth elements with alkali metals is important from the standpoint of the development of procedures for the separation of rare-earth elements.

24. Investigation of State of Zirconium in Solutions by Method of Ion-Exchange Adsorption

"The State of Zirconium in Hydrochloric Acid, Ammonium Carbonate, and Complexon III Solutions," by I. P. Alimarin, T. A. Belyavskaya, and Mu Ping-wen; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 645-649

The adsorption of zirconium from hydrochloric acid, ammonium carbonate, and complexon III solutions by the ion-exchange resins KU-2, EDE-10P, AN-2F, and AV-17 was investigated in a wide range of concentrations of the complex-forming solutions. On the basis of data obtained with regard to the adsorption of zirconium by ion-exchange resins and some data obtained by the paper electrophoresis of hydrochloric acid solutions containing this element, assumptions are made concerning the state in which zirconium is present in solutions.

25. Esters of Aminobenzoylamidophosphoric Acids

"Esters of Aminobenzoylamidophosphoric Acids," by A. V. Kirsanov and N. G. Feshchenko, Institute of Organic Chemistry of the Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 267-270

Aminobenzoic acids and their derivatives are of great physiological importance. For this reason authors undertook to prepare the esters of aminobenzoylamidophosphoric acids and to investigate their physiological properties. The synthesis of these esters was carried out by applying the following general reactions:

$$NO_2C_6H_4CONH_2 \xrightarrow{+PCl_5} NO_2C_6H_4CON\ PCl_3 \xrightarrow{+HCOOH}$$

$$\rightarrow NO_2C_6H_4CONHPOCl_2 \xrightarrow{+2ROH} NO_2C_6H_4CONHPO(OR)_2 \xrightarrow[Pt]{+H_2} \rightarrow$$

$$\rightarrow NH_2C_6H_4CONHPO(OR)_2:$$

$R = CH_3$ or C_6H_5.

The benzoyl derivatives were prepared to characterize the esters. These derivatives are comparatively high-melting crystalline substances which behave as monobasic acids when titrated.

The physical characteristics of the 12 prepared compounds are presented in two tables. No physiological data are given in the report.

26. Synthesis of Trialkyldithiophosphates and Tetraalkyldithiopyrophosphates

"From the Field of Organic Insectofungicides. LIV. New Method of Obtaining Trialkyldithiophosphates and Tetralkyldithiopyrophosphates," by N. N. Mel'nikov, K. D. Shvetsova-Shilovskaya, and M. Ya. Kagan, Scientific Institute of Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 200-203

The research reported forms a part of a more extensive investigation aimed at the development of new insecticides and defoliants. The study of the reaction between dialkyl- and tiralkyl-phosphites and bis(dialkoxythiophosphon)disulfides (I) described in this instance was undertaken

for that purpose. On the basis of results obtained from this study, the authors were able to establish that the reaction between I and dialkylphosphites in the presence of triethylamine proceeds according to the following general equation:

$$[(RO)_2PS]_2S_2 + (R'O)_2POHN(C_2H_5)_3 \rightarrow (RO)_2PSSR' + (C_2H_5)_3NHPO_3.$$

The compounds obtained by this reaction and their properties are listed tabularly. Most of them had not previously been synthesized.

The reaction between I and trialkylphosphites takes place with the formation of both trialkyldithiophosphates and the previously unreported tetralkyldithiopyrophosphates. This reaction can be represented by the following general equation:

$$[(RO)_2PS]_2S_2 + (R'O)_3P \rightarrow (RO)_2PSSR' + (RO)_2PSSPO(OR')_2$$

Excellent yields of both trialkyldithiophosphates and tetraalkyldithiopyrophosphates are obtained by this reaction. However, small quantities of by-products are also formed. The compounds obtained in the reactions between I and trialkylphosphites are listed in tables, together with their properties.

27. Less Toxic Insecticides Sought by Research Team

"From the Field of Organic Insectofungicides. LI. Synthesis of Several O,O-dialkylarylmercaptomethyldithiophosphates," by K. D. Shbetsova-Shilovskaya, N. N. Mel'nikov, M. Ya. Kagan, and V. A. Glushenkov, Scientific [Research] Institute of Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 193-194

Many of O,O-dialkyl-alkylmercaptomethyldithiophosphates are sufficiently active systemic insecticides. O,O-diethyl-ethylmercaptomethyldithiophosphate has been used for treating cotton seeds. However, the compounds have the serious disadvantage of being highly toxic to warm-blooded animals, which limits their use as insecticides. The authors have undertaken to find among the O,O-dialkyl-arylmercaptomethyldithiophosphates (I) compounds which are active insecticides but fairly safe for man and domestic animals.

A number of previously unknown compounds of the (I) type were synthesized by reacting the salts of dialkyldithiophosphoric acid with chloromethylarylsufides in benzene or alcohol:

$$(RO)_2PSSMe + ClCH_2SAr \rightarrow (RO)_2PSSCH_2SAr + MeCl.$$

The studies of insecticidal properties conducted by P. V. Popov and N. S. Ukrainets on barn weevils demonstrated that the highest activity in the series of compounds (I), which is exhibited by O,O-dimethyl- and O,O-diethyl-arylmercaptomethyldithiophosphates, decreases rapidly with increasing size of the aliphatic ester radical.

28. USSR Research on Antitumor Compounds

"Synthesis of Several (β-Chloroethyl))amino Derivatives of Thiophene," by Ya. L. Gol'dfarb and M. S. Kondakova, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 102-107

The authors describe the synthesis and characteristics of 3-di-(β-chloroethyl)-aminomethyl-2,5-dimethylthiophene hydrochloride, the hydrochlorides of 3-di-(β-chloroethyl)-aminomethyl-4-(β-chloroethyl)-methylaminomethyl-2,5-dimethylthiophene and 3,4-bid-[di-(β-chloroethyl)-aminomethyl]-2,5-dimethylthiophene, and their corresponding aminoalcohols. The work on these compounds was done for the purpose of obtaining new antitumor drugs.

The toxicity and antitumor activity of the chloroethylamino derivatives of thiophene were studied by P'an Ch'i-ts'ao in the Laboratory of Experimental Chemotherapy of the Institute of Experimental Pathology and Therapy of Cancer of the Academy of Medical Sciences USSR. All of the substances appeared to be fairly toxic. However, they were far less toxic than embikhin. Their antitumor activity was studied on sarcoma "45" in rats and on Ehrlich's tumors in mice. These studies showed that these compounds do not render a sufficiently noticeable inhibitory effect on the growth of tumors.

29. Reactions of Magnesium Ethylate With Aryldichlorothiophosphates

"From the Field of Organic Insectofungicides. LII. Concerning the Interaction of Aryldichlorothiophosphates With Magnesium Ethylate," by Ya. A. Mandel'baum, N. N. Mel'nikov, and Z. M. Bakanova, Scientific [Research] Institute of Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 194-197

The authors found that magnesium ethylate reacts with aryldichlorothiophosphates according to the following general reaction schemes:

$$2\ ArOPSCl_2 + (C_2H_5O)_2Mg \rightarrow 2\ ArO\diagdown\!\diagup PSCl + MgCl_2 \qquad (I)$$
$$C_2H_5O$$

$$2\ ArO\diagdown \atop C_2H_5O\diagup PSCl + (C_2H_5O)_2Mg \rightarrow 2\ ArOPS(OC_2H_5)_2 + MgCl_2 . \quad (II)$$

In the case of 4-nitrophenyl- and 2,4,5-trichlorophenyldichlorothiophosphates, the following re-esterification takes place in addition to reactions (I) and (II) above:

$$2\ ArOPS(OC_2H_5)_2 + (C_2H_5O)_2Mg \rightarrow 2\ (C_2H_5O)_3PS + (ArO)_2Mg.$$

30. Hypothesis in Regard to Phosphorylation of Cholinesterase Doubted by Soviet Chemists

"From the Field of Organic Insectofungicides. LIII. On the Interaction of Esters of Thio- and Dithio-phosphoric acids with Tertiary Amines," by N. N. Mel'nikov, K. D. Shvetsova-Shilovskaya, and I. M. Mil'shteyn, Scientific /Research/ Institute of Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 197-199

"Organophosphorus compounds have been widely used in agriculture in recent years for controlling plant pests. The compounds principally used were mixed esters of thio- and dithio-phosphoric acids. As a result, the traditional insecticides such as nicotine, anabasine, and others have been almost entirely displaced. Intensive scientific work is being conducted in many countries both in the search for new, active substances and in study of the mechanism of action of organophosphorus compounds on insects, since the determination of the action mechanism of a given class of compounds on insects should provide a guide to their synthesis from this standpoint.

"According to current thinking, the mechanism of insecticidal and other biological action of organophosphorus compounds is connected with the phosphorylation of such enzymes as cholinesterase (or others similar to it), as a result of which the normal vital functions of the insect organism are disturbed. Usually this process of phosphorylation occurs most readily with compounds which contain electrophilic radicals that are easily split off by the action of water or other reagents.

"Nevertheless, our laboratory has recently established that high insecticidal activity is exhibited by some organic phosphorus compounds which do not contain these easily split off radicals at the phosphorus atom. Moreover, the insecticidal activity was found to be sharply changed in the transition, for example from esters of phosphonoacetic acid to esters of phosphonothioacetic acid, in which the acetic acid group ($-CH_2COOH$) is sufficiently firmly attached to the phosphorus and cannot even be split off by heating in an acid solution. Other similar examples have been cited in the patent literature.

"On the basis of these observations, the hypothesis was expressed that the phosphorylation of choline esterase by substitution cannot be the only explanation for the action of organophosphorus insecticides inasmuch as suppression of cholinesterase in certain plant pests does not cause death. Another possible direction of the action of organophosphorus insecticides, apparently, is the formation of quaternary ammonium salts as a result of the interaction of esters of thio- and dithio-phosphoric acids with tertiary nitrogen atoms, present in many enzymes and in nucleic acids.

For the purpose of confirming this hypothesis, the authors undertook the study of the reactions of esters of thiophosphoric and dithiophosphoric acids with tertiary amines since there are no descriptions of this type of compound in the literature. As a result of the experiments conducted, they report that they were able to establish that esters of thio- and dithio-phosphoric acid with a greater or lesser facility interact with tertiary amines forming the corresponding quaternary ammonium base salts as the chief reaction products. Esters of thiophosphoric acid which contain even one methoxy radical and also aromatic acid radicals react most readily.

The compounds synthesized by the authors, and their properties, are listed in tabular form. Nearly all of the synthesized compounds are readily soluble in water and are very hygroscopic.

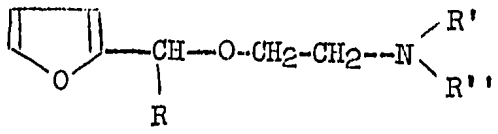
31. Preparation of Pharmacologically Active Compounds at the Armenian Institute of Fine Organic Chemistry

"Investigation in the Field of Furan Derivatives. Report 22: Several Dialkylaminoethyl Ethers of Furylalkyl- and Furyl-p-alkoxy-phenyl Carbinols," by A. L. Mndzhoyan, Academician of the Academy of Sciences Armenian SSR, and O. L. Mndzhoyan and E. R. Bagdasaryan, Institute of Fine Organic Chemistry of the Academy of Sciences Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 29, No 1, 1959, pp 41-47

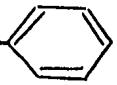
In one of the previous reports by the authors, several aminoethers of furylalkyl and furylaryl carbinols and data obtained in the preliminary pharmacological investigation of their oxalates were described.

In a further, more detailed study conducted at the Pharmacological Department of the Institute of Fine Organic Chemistry, it was learned that the quaternary ammonium salts of these aminoethers, in very small doses, relieve experimental bronchospasms caused by proserine; thus for example, the iodomethylate of diethylaminoethyl ether of furylbutyl carbinol in a dose of 0.1 mg/kg completely relieves proserine-caused bronchospasms.

This circumstance was the basis for the further work on the synthesis of aminoethers of furylalkyl and arylcarbinols which are described in the article and which have a constitution corresponding to the general formula:



where

$R = i\text{-}C_3H_7;\ C_4H_9;\ i\text{-}C_5H_{11};\ H\text{-}C_5H_{11};$ R''—O— 

$R'' = CH_3;\ C_2H_5;\ C_3H_7;\ C_4H_9;\ C_5H_{11}$

$R' = CH_3;\ C_2H_5$.

The aminoethers were obtained by the interaction of the corresponding aminochlorides and furylalkyl and arylcarbinols in the presence of alkaline condensing agents.

The required furylalkyl carbinols were prepared by the Grignard reaction, while the furylalkoxyphenyl carbinols were obtained by the reduction of the corresponding ketones with the aid of zinc dust in an alcoholic solution of alkali.

The dialkylaminoethyl ethers of p-alkoxyphenylfuryl carbinols which were prepared by reacting the corresponding dialkylaminoethylchlorides with p-alkoxyphenylfuryl carbinols in the presence of metallic sodium are thick, oily liquids. Their purification was accomplished by crystallizing them in the form of their oxalates.

Several physico-chemical constants of the prepared compounds are listed in 5 tables.

The authors state that the data obtained in pharmacological investigations will be published separately.

32. Relation Between Energy of Formation of Molecules From Free Atoms and Structure of These Molecules

"Relation Between the Energy of Formation of Molecules From Free Atoms and the Structure of These Molecules," by V. M. Tatevskiy and Yu. G. Papulov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 2, Feb 60, pp 241-258.

On the example of alkanes, a method is considered of expressing the energy of molecules as a sum of the energies of the chemical bonds formed by individual atoms. This method is based on the relation expressed by the fundamental equation underlying the method (Equation 1) and the a-classification of chemical bonds in the molecule which is assumed to be valid.

$$E_{C_nH_{2n+2}} = \sum_{C-C} \varepsilon_{C-C} + \sum_{C-H} \varepsilon_{C-H} \qquad (1)$$

It is shown that, depending on the classification of bonds, definite equations are derived which express the relation between the energy of formation and the structure of molecules.

It is brought out that the most consistent classification of chemical bonds for alkanes at present is into 10 types of the C-C bond and 4 types (subtypes) of the C-H bond. This classification was proposed earlier by V. M. Tatevskiy. Kh. S. Bagdasaryan's and K. J. Laidler's classification, which postulates one type of the C-C bond and 4 types of the C-H bond and partly reflects the effect of structural isomerism, and the classification based on classical theory, which assumes the existence of a single type of C-C bond and a single type of C-H bond and does not at all reflect the effect of structural isomerism, are particular cases of Tatevskiy's classification, which at present takes the fullest possible account of effect of structural isomerism.

It is demonstrated that the classification postulating the existence of 10 types of the C-C bond and 4 types of the C-H bond also takes into account the influence of rotational isomerism. The possibility is demonstrated of calculating the difference between the energies of rotational isomers on the basis of experimental data in regard to the concentrations of these isomers at the same temperature and the values of certain constants derived from thermochemical data pertaining to energies of formation. The difference between the energies of rotational isomers has

been calculated for the structural element $C_2 - C_2$ (n-butane) and found to be equal to 0.66 kilocalories per mol. This compares with the experimentally determined value of 0.77 kilocalories per mol for n-butane.

The equations used in the calculation are substantiated from the quantum-mechanical standpoint by applying the method of localized valency pairs, which is based on J. C. Slater's formula and its generalization, i.e., M. F. Mamotenko's formula. It is shown that the constants entering into equation 2 /Equation 5, p 246/ can be represented by the corresponding quantum-mechanical integrals.

$$E_{C_nH_{2n+2}} = \sum_{\substack{i,j=1 \\ i \leqslant j}}^{4} n_{ij}A_{ij} \qquad (2)$$

It is pointed out that quantum-mechanical derivation of equations can be applied to molecules of any class and that by using this method (and taking into consideration only the immediate environment of the bond), one will always arrive at equations analogous to those which follow from the concepts pertaining to types and species of chemical bonds which have been advanced earlier by Tatevskiy.

33. Method of Calculating Energy of Molecules as a Sum of Energies of Pairwise Interactions Between Atoms

"Relation Between the Energy of Formation of Molecules From Free Atoms and the Structure of These Molecules; Part 2 -- The Energy of Molecules as a Sum of the Energies of Pairwise Interactions Between Atoms (Second Method)," by V. M. Tatevskiy and Yu. G. Papulov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 3, Mar 60, pp 489-504.

This article deals with a method for calculating the energy of formation of molecules which is designated as the second method to distinguish it from the first method that was proposed by the authors in Zhurnal Fizicheskoy Khimii, Vol 34, No 2, Feb 60, pp 241-258 (of preceding item). The second method represents the energy of molecules as a sum of energies corresponding to pairwise interactions between atoms entering into the composition of the molecules. It is based on the fundamental equation (1) given below and a classification of pairwise interactions between atoms which is assumed to be valid.

$$E_{C_nH_{2n+2}} = \sum_{CC} \varepsilon_{CC} + \sum_{CH} \varepsilon_{CH} + \sum_{HH} \varepsilon_{HH} \qquad (1)$$

In equation 1, $E_{C_nH_{2n+2}}$ is the energy of formation of an alkane C_nH_{2n+2}, and the three terms on the right side are sums of the energies of pairwise interactions of atoms of carbon with atoms of carbon, atoms of carbon with atoms of hydrogen, and atoms of hydrogen with atoms of hydrogen.

It is shown that, depending on the classification of interactions of atoms by pairs, definite equations can be derived which express the relation between the energy and structure of molecules. The best known classification of pairwise interactions is that proposed by H. J. Bernstein. It is demonstrated that a superfluous constant has been introduced into Bernstein's equation which corresponds to this classification. The coefficients of this equation have been expressed in an explicit form in terms of the numbers of bonds of different types in alkanes. The classification of interactions of atoms by pairs which has received the widest acceptance at present is given. On the basis of this classification, an equation has been derived for the energy of formation of alkanes which is equivalent to the corresponding equation of the first method. It is shown that every equation of the second method which is based on an appropriate classification of pairwise interactions is completely equivalent mathematically to some equation of the first method that is based on a corresponding classification of bonds. It was established that there is a correlation between the magnitudes of the energies of different types of bonds in the first method of calculation and the magnitudes of individual pairwise interactions between atoms in the second method of calculation.

34. Energy Transfer in the Radiolysis of Some Hydrocarbons

"Investigation by the Electronic Paramagnetic Resonance Method of Energy Transfer in the Radiolysis of Some Frozen Hydrocarbons," by Yu. N. Molin, I. I. Chkheidze, A. A. Petrov, N. Ya. Buben, and V. V. Voyevodskiy, Corresponding Member Academy of Sciences USSR, Institute of Chemical Kinetics and Combustion of the Siberian Branch, Academy of Sciences USSR, Institute of Chemical Physics of the Academy of Sciences USSR, and Institute of Geology and Production of Mineral Fuels of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 1, 1 Mar 60, pp 125-128.

The transfer of energy in the radiolysis of the compounds 1,1-dicyclohexyldodecane (I), 1,1-diphenyldodecane (II), 1-phenyl-1-cyclohexyldodecane (III), cyclohexane, and benzene irradiated with fast electrons (1.6 Mev) at minus 120° was investigated by the method of electronic paramagnetic resonance. It was established that as a result of the irradiation of I, a large quantity of cyclohexyl radicals is formed. The electronic paramagnetic resonance spectra of II and III are identical and analogous to the spectrum of irradiated benzene, i.e., only radicals of two types are formed, one by splitting of an H-atom from the benzene ring and one by the addition of an H-atom to the benzene ring.

When a mixture of I and II is irradiated, the electronic paramagnetic resonance spectrum of the mixture containing radicals resembles that of II rather than I because the radicals are formed predominantly from II by reason of the transfer of energy to the benzene rings of II. The low radiation yield found in the case of the mixture of I with II may be regarded as a proof of the transfer of energy from I to II; it is estimated that about 10% of the molecules of I cannot transmit their energy effectively to molecules of II. Nevertheless, the radiation yield of the formation of radicals from a mixture of I + II is higher than that found in the case of irradiation of II alone.

The yields of radicals from compounds II and III are almost 3 times higher than those from benzene. The higher yields can be ascribed to a reduction of the stability of the benzene ring because of the introduction of a substituent into them.

35. Problem of the Formation of Defects and Radicals in Aluminum Oxide Under the Action of γ-Radiation

"Electronic Paramagnetic Resonance in Irradiated Aluminum Oxide," by V. B. Kazanskiy and Yu. I. Pecherskaya; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 2, Feb 60, p 477

Irradiation at the temperature of liquid nitrogen of aluminum gamma-oxide with γ-rays emitted by Co^{60} resulted in the development of an electronic paramagnetic signal with a g-factor close to 2. This signal disappeared after annealing. Experiments by H. W. Kohn and E. H. Taylor (Journal American Chemical Society, Vol 79, 1957, p 252; Journal Physical Chemistry, Vol 63, 1959, p 500) established that increased catalytic activity developed by aluminum oxide samples after γ- irradiation disappeared upon annealing. One may conclude that the electronic paramagnetic signal which was observed is connected with centers responsible for the heightened catalytic activity of irradiated aluminum oxide. Kohn and Taylor were unable to detect formation of defects or radicals in aluminum oxide by the method of electronic paramagnetic resonance.

Radiochemistry

36. Separation of Bismuth and Lanthanum Isotopes by Electrolysis

"Application of Internal Electrolysis for the Separation of Some Radioactive Elements in a Carrier-Free State," by B. Z. Iofa; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 706-708

It was established that it is possible to isolate some radioactive isotopes in a carrier-free state by applying the so-called method of internal electrolysis. Procedures are proposed for the separation in a carrier-free state of bismuth isotopes (Th C and RaE) and of lanthanum La^{140} from the parent radioisotopes by the method described.

37. Radiometric Method in the Search for Gas-Oil Deposits

"On the Radiometric Method of Searching for Gas-Oil Deposits," by V. I. Baranov, N. G. Morozova, K. G. Kanasheva, Ye. V. Babicheva, and B. V. Karasev, Institute of Geochemistry and Analytical Chemistry, Academy of Sciences USSR, Moscow; Moscow, Geokhimiya, No 6, 1959, pp 530-537

Samples of the surface layer of rocks at a depth of 25 cm from the gas-condensate deposit Kyzyl-Kum and the underground structure Gekcha (Western Turkmenia) were selected and analyzed to find out the causes of the typical distribution of intensity of γ-radiation which is observed in several oil-bearing areas.

The results of analyses showed that the distribution of γ-radiation is connected with a parallel concentration change of all radioactive elements (U, Ra, Th and KO).

Radon is not contained in oil gases in quantities sufficient to cause the observed change of intensity of γ-radiation along the outline of the deposit.

These results indicate that as far as the above structures are concerned, the hypothesis in regard to a connection between the γ-radiation, which is typical for some oil deposits, and the deposition daughter products of radioactive decay of radon along the outline of the oil-bearing bed is not confirmed.

38. Application of the Radioactivation Method for the Determination of Microimpurities in Tellurium

"Application of Radioactivation Analysis for the Determination of Microimpurities in Tellurium," by O. Ye. Zvyagintsev and V. I. Shamayev; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 717-723

A method has been developed for determining microquantities of nickel, copper, arsenic, cadmium, antimony, gold, selenium, indium, cobalt, chromium, mercury, silver, and calcium in high-purity tellurium by applying the radioactivation method. The method proposed for the chemical separation and purification of the elements being determined makes it possible to isolate substances which are radiochemically pure and to achieve chemical yields of carriers amounting to 20-70%. The sensitivity of the determination of individual elements is within the range of 10^{-11} - 10^{-7} grams. The precision of the determination of individual elements at concentrations of the order of 10^{-7} - 10^{-5} comprises 15-40%. The possibilities of self-screening and of the formation of radioactive antimony from the irradiated tellurium were investigated.

39. Formation of the Radioactive Isotope Beryllium-7 in a Nuclear Reactor by a Secondary Nuclear Reaction

"Formation of the Radioactive Isotope Beryllium -7 in a Nuclear Reactor by a Secondary Nuclear Reaction," by N. P. Rudenko and A. I. Sevast'yanov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 691-693

The new nuclear reaction Li^6 (T,2n) Be^7 was discovered. It was established that the radioactive isotope Be^7 forms in nuclear reactors by a secondary nuclear reaction. The over-all cross-section of the reactions of the formation of Be^7 in a nuclear reactor was determined. It is pointed out that it is possible to produce simultaneously radioisotopes which can be used as tracers for beryllium and fluorine by irradiating lithium carbonate in a nuclear reactor.

40. Separation of Mn^{56} Produced by the Irradiation of Colloidal Manganese Dioxide

"Separation of Radioactive Isotopes Following Irradiation of Colloidal MnO_2," by A. N. Nesmeyanov, V. M. Korolev, and L. A. Sazonov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 694-699

By investigating the isolation of the product of the reaction Mn^{55} (n, γ) Mn^{56} after irradiation of colloidal manganese dioxide, it was established that separation of radioactive isotopes from colloidal systems after their irradiation can, in some cases, be carried out by employing surface-active substances or nonisotopic carriers. In cases in which the purpose of the separation is isolation of the radioactive isotope with a maximum degree of enrichment, it is possible to carry out separation with a good yield on an isotopic carrier. Ferric iron was used as a carrier in this case.

III. EARTH SCIENCES

41. Use of Geomagnetic Field in Geophysical Prospecting

"Principles of Geophysical Prospecting by the Method of Investigating the Earth's Electromagnetic Field," by V. B. Porfir'yev, Member of the Academy of Sciences, Ukrainian SSR; Kiev, Dopovidi Akademii Nauk Ukrains'koy RSR, No 2, 1960, pp 159-163

The dependence of the ratio of the amplitude of the horizontal components of the Earth's electromagnetic field on the geoelectric characteristics of a two- and three-layer section is investigated with the use of formulas for calculations of the resistance of semiconductors in the skin-effect. It is shown that at a frequency of oscillation of the electromagnetic field $f \leq 0.05$ cycles, the value of the equation $R = \left(\frac{1}{Z}\right) = -\frac{H}{E}$ is numerically equal to the longitudinal conductivity of the upper layer lying on a nonconducting base (the crystalline foundation of the Earth's crust).

The possibilities of carrying out electromagnetic profiling by comparing the amplitude of the derivative with respect to time of the vertical component of the geomagnetic field with the horizontal component of the gradient of the potential of earth currents are demonstrated.

42. On the Rhenium Distribution of Molybdenites From Deposits of a Series of Genetic Types

"On the Rhenium Distribution in Molybdenites From Deposits of a Series of Genetic Types," by K. K. Zhirov and G. F. Ivanova, Chair of Geochemistry, Moscow State University; Moscow, Geokhimiya, No 6, 1959, pp 518-523

The rhenium content was determined in 19 molybdenites from deposits of two genetic types of the Central Kazakhstan.

The average rhenium content in molybdenites from high temperature rare-metal deposits (Kara-Oba, Akchatau, Airshoko, Dal'nenskoye) is $2.5 \times 10^{-4}\%$ with a fluctuation from $1.0 \times 10^{-4}\%$ to $5.6 \times 10^{-4}\%$. In deposits of the middle-temperature type (Shalgia), the average content is considerably higher and amounts to $3.2 \times 10^{-3}\%$ with a fluctuation of from $2.2 \times 10^{-3}\%$ to $3.9 \times 10^{-3}\%$.

A comparison of the data obtained with the results of molybdenite analyses carried out on samples from deposits of other types (skarn and copper - molybdenite types) shows the existence of a general regularity consisting of an increase of the rhenium content in molybdenites with a fall in the temperature of deposit formation.

43. Elastic Wave Propagation in Spherical Underground Explosion

"On the Radiation of an Elastic Wave During a Spherical Explosion in the Ground," by N. V. Zvolinskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 126-133

An earlier work on the subject (Ishlinskiy, Zvolinskiy, and Stepanenko, "On Soil Dynamics," Doklady AN SSSR, Vol 95, No 4, 1954) considered the problem for the case of an inelastic-plastic medium.

This article deals with an elastic-plastic medium (in relation to the packing effect) where the flow of the medium in the incompressible state is caused by a property analogous to internal friction. The presence of an initial elastic region on the deformation diagram affords the possibility of visualizing the entire process of propagation of the explosion wave, including the radiation of the elastic wave. The problem is considered here for the case of spherical symmetry.

Communications

44. New Radio-Relay Lines

"Some Problems in Development of Radio-Relay Lines," by A. Fortushenko; Moscow, Nauchno-Tekhnicheskiy Obshchestva SSSR, No 2, Feb 60, pp 28-29

During the Seven-Year Plan it is planned to increase the length of the existing radio-relay lines about 8.4 times. Several telephone-television radio-relay lines incorporating "Strela" equipment were built in the USSR, operating in the frequency range of 1,600-2,000 Mc. A telephone-television radio-relay line between Moscow and Smolensk was built using P-60 type equipment.

The Scientific Research Institute of the Ministry of Communications USSR has designed more powerful equipment designated P-600 for operation in the frequency range of 3,400-3,900 Mc. This equipment is capable of transmitting simultaneously on five duplex radio-communications trunks; each trunk can handle 600 telephone channels or two television programs. In 1960 and succeeding years, a number of radio-relay lines will be built utilizing the new P-600 equipment.

45. Recent Soviet Patents in Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 3, Mar 60, p 73

Class $21a^1$, 7_{05}. No 122166. A. K. Kordobovskiy. A Method for Testing Telegraph Lines for Reliability

Class $21a^1$, 9_{02}. No 122167. V. G. Lugvin. Device for Automatic Elimination of Telegraph Signal Displacement Due to the Shift of Carrier Frequency in the FM Tonal Telegraphy Channel

Class $21a^1$, 13_{02}. No 122168. K. A. Mal'tsev and A. D. Konyagin. A Computer-Integrating Device for Phase Correction in Synchronized Telegraph Equipment

Class $21a^1$, 32_{04}. No 121815. R. A. Kudryavtsev. A Method of Amplitude Modulation of Video Signal

Class 21a[1], 32_{11}. No 122170. A. V. Vatsenko, M. V. Gitlits, and V. G. Patrunov. A Method for Correcting Semitone Images Recorded With the Aid of Ferrography of the Modulated Signals.

Class 21a[1], 33_{50}. No 122171. I. I. Tsukerman. A Method for Compensating the Noise Background of the Video Signal

Class 21a[1], 36. No 122172. A. M. Chernushenko. A Method for Obtaining Millimicrosecond Pulses

Class 21a[1], 41_{07}. No 121820. G. Z. Matusevich. Measuring Device for the Control of Residual Attenuation in the Channel of a Telephone Line

Class 21a[4], 21. No 121821. K. K. Simul'. Wave guide Directional Coupler.

Class 21a[4], 22_{05}. No 122497. E. N. Maykhrovskiy. A Method for Suppressing Random Pulse Interferences

Class 21a[4], 46_{06}. No 122501. V. D. Kuznetsov and V. K. Paramonov. A Method for Power Feeding to Complex Antennas

Components

46. Investigation of Operating Characteristics of Ferrite Amplifiers

"Experimental Investigation of a Ferrite Amplifier," by V. P. Tychinskiy, Yu. T. Derkach, and V. V. Karpetskiy; Moscow, Radiotekhnika i Elektronika, Vol 5, No 2, Feb 60, pp 288-295

Information is presented on some of the results of a study of a ferrite amplifier operating in a ferromagnetic system. The experimental measuring apparatus consists basically of a pulse magnetron as the source of excitation power and a semiautomatic recorder for recording the spectrum of power absorption in the ferrite, for controlling the resonance tuning of the ferrite element, and for reading the excitation power level. A klystron oscillator serves as the source of amplified signals.

The measured amplification value reached approximately 22 db for an excitation power on the order of 5 kw.

A circuit is suggested for studying the phase characteristics of the amplifier, and results prove to be in good agreement with data published by other authors.

Preliminary conclusions reached by the authors include the following.

1. Regenerative types of ferrite amplifiers with lumped constants have a relatively narrow frequency band ($<0.1\%$) which decreases with increases in amplification.

2. The comparatively high levels of threshold power and unfavorable cooling conditions of ferrite elements necessitates the use of a relatively high pulse spacing factor.

3. The parametric theory of ferrite amplification indicates the possibility of operating at an excitation frequency less than that of the amplified signal; however, there are no clear prospects at present for decreasing excitation frequency.

47. Quasilinear Method for Analyzing a Blocking Oscillator

"Shaping Pulse Peaks in a Blocking Oscillator Using a Junction-Type Semiconductor Triode," by B. S. Mel'nikov; Moscow, Radiotekhnika i Elektronika, Vol 5, No 2, Feb 60, pp 323-329

A quasilinear method of analyzing a blocking oscillator is proposed which is based on the operating characteristics of junction-type transistors, namely: pulse characteristics correspond to characteristics taken for direct current if, in taking the latter, the dissipated power in the triode is less than nominal; the triode is located in a state of supersaturation during generation of pulse peaks; the output impedance of the triode is great during amplification and negligible during supersaturation; and the input characteristics under supersaturation conditions depend only on the saturation current.

Amplitude, duration, and shape of the generated pulse were determined with an accuracy of 15-20%.

48. New Electronic Equipment Manual

"New Book" (unsigned article); Moscow, Radio, No 3, Mar 60, p 64

A short announcement reads as follows: "The State Technical Publishing House of the Ukrainian SSR (Kiev) has published in the Ukrainian language an electronic equipment manual. D. S. Gurlev and A. T. Yura, the authors of this new book, have accumulated extensive material on electronic equipment, which has been supplemented by tables, tube characteristics diagrams, standard circuits for the tubes, etc."

49. Cold-Cathode Vacuum Tubes

"Cold-Cathode Radio Tubes" (unsigned article); Moscow, Izobretatel' i Ratsionalizator, No 3, Mar 60, p 41

A nickel-wire cathode of a vacuum tube having a thin coating of magnesium oxide will emit a beam of electrons when subjected to short duration irradiation by a beam of electrons or ultraviolet rays, even without heating the electrode.

50. Use of Semiconductor Devices in Agriculture

"Applications of Semiconductors in the Field," by Prof A. Chudnovskiy (Leningrad); Moscow, Ogonek, Vol 38, No 3, 17 Jan 60, p 21

"The application of semiconductors will make the work of agronomists easier. USSR scientists have developed a number of devices which function reliably under the complex and changeable conditions encountered in the field. These devices record automatically the temperature of the surface of the soil and at different depths of the soil, and measure the temperature and humidity of the air, the wind velocity, the amount of heat supplied by the sun to plants, the quantity of moisture which evaporates from the soil, and many other variables.

"To control the living processes of the plant, one must have more data than those which pertain to conditions encountered in the environment, It is even more important from this standpoint to observe internal processes of the growth and development of plants. This can be done with the aid of semiconductors. Semiconductor devices measure and indicate the temperature of different organs of the plant, enable one to determine the rate of flow of juices inside the plant, and make it possible to measure evaporation.

"Semiconductor devices can also be used in weather forecasting. At the Agrophysical Institute, an automatic device has been designed which predicts in the evening the possibility of the occurrence of frost during the coming night. This device is very simple and is available to every kolkhoz.

"Semiconductor appliances can be used for the automatic control of the temperature and humidity during the storage and transportation of grain, potatoes, flour, and other products.

"The first semiconductor generators of electrical power have been constructed. These generators utilize locally available waste as fuel and supply power for the lighting of buildings and electric milking. The heat which is generated during the passage of electric current through semiconductor thermocouples can be used to advantage for the pasteurization of milk and the heating of water at farms. In the future, power generated in this manner will be used for heating buildings."

Computers

51. Analog Computers for Electric Network Analysis

"Application of Electronic Analog Computers to Investigate Transients in Electric Networks," by I. A. Gruzdev and M. L. Levinshteyn, Leningrad Polytechnic Institute imeni Kalinin, Moscow, Elektrichestvo, No 3, Mar 60, pp 1-14

The electronic analog computers now manufactured in the USSR do not have a sufficient number of computing elements to solve certain complex problems of network calculation. The presently manufactured analog computers (IPT-5, IPT-4, MPT-9, MPT-11, MN-1, MN-2, MN-7, MN-8, MNB, EMU-5, EMU-8, and KNB) have only 12-80 computing elements; however, several such machines can be combined for the solution of complex problems.

A special analog computer for network analysis, incorporating step-by-step selector switches actuated by relay circuits, was built at the High-Voltage Line and Network Laboratory imeni Gorev at Leningrad Polytechnic Institute. The most complex electric system that can be investigated, with the present status of analog computer technology, is a system composed of three generating stations with two or three load distributing centers. Further improvement in the methods of network analysis with the aid of analog computers, should be directed toward the betterment of the computer's components, as well as the development of simpler methods for the solution of various types of equations, especially the partial derivative equations.

Instruments and Equipment

52. Video Tape Recording

"An Image on Magnetic Tape" (unsigned item); Moscow, Televideniye, No 10, 5 Mar 60, p 8

"Is it possible to record a television image on a magnetic tape? Such an image consists of electric pulses similar to those produced by sound, but with a frequency of electromagnetic oscillations about 600 times higher. Yes, it is possible.

"Recently, a concert recorded on magnetic tape was demonstrated on television. Later, the spectators were acquainted with the technique of this remarkable invention.

"The video-tape recorder (videó-magnitophone) is closely related to the tape recorder (magnitophone). However, the two machines differ considerably from each other. In the first place, one's attention is attracted by the unusually wide magnetic tape, i.e., it is eight times wider than the tape needed for recording sound.

"The electric signals of the television image are recorded on it in the form of narrow transverse tracks; such an unusual recording is carried out by four magnetic recording heads placed on a disk rotating with a speed of 15,000 rpm. The speed of movement of the magnetic heads with respect to the magnetic tape reaches 40 meters per sec or 144 kilometers an hour. Such a high speed permits recording on the magnetic tape electric oscillations of several million times per second.

"At the same time, the speed of the magnetic tape is less than 40 cm per sec, i.e., is only twice as fast as that of a tape in a magnetic sound recorder. At such a speed, a 30-centimeter reel can hold enough magnetic tape for an hour and a half of recording. This is ample time to record a large television performance.

"The accompanying sound is recorded simultaneously by a stationary magnetic recording head along the upper edge of the tape. If the recording on the magnetic tape is made visible, then the transverse tracks of the recorded image will be observed. On the upper part of the tape will appear a longitudinal track of the accompanying sound recording, and in the lower part will appear a track of the monitoring service signal.

"When the recording is finished, the tape is rewound in about 5 minutes, and the program is ready for demonstration."

A photograph shows one of the laboratories of the All-Union Scientific Research Institute for Sound Recording. The leading engineer, A. Spirin, and the director, V. Parkhomenko, are shown during a test recording of a television program.

53. High-RPM Precision Tachometers

"Methods and Instruments for Precision Measurement of Angular Velocities" (unsigned article); Moscow, Izmeritel'naya Tekhnika, No 2, Feb 60, p 64

The Expert Council at the Committee on Standards, Measures, and Measuring Instruments has recently reviewed the status of metrology research to improve the methods and instruments for precision measurement of angular velocity. The tachometers now in use can measure angular velocities up to 50,000 rpm with an accuracy of 0.03%.

At the All-Union Scientific Research Institute for Metrology imeni D. I. Mendeleyev, a new standard tachometer capable of measuring angular velocities up to 60,000 rpm with an accuracy of 0.01% was built. The value of the angular velocity is determined in this instrument by reading the values of standard frequencies of a piezoelectric oscillator.

The Expert Council resolved that work should be carried out on the design of a tachometer capable of measuring angular velocities up to 150,000 rpm.

54. AC Network Calculator

"Electrical Calculation Analog for AC Electric Networks," by D. I. Azariyev; Moscow, Elektricheskiye Stantsii, No 2, Feb 60, pp 41-52

A network analog calculator developed at the All-Union State Institute for the Design and Planning of Thermal Electric Power Plants (Teploelectroproyekt) is universal in its performance and can be used to investigate any type of electric power network. This analog network calculator is very useful in the design and operating stages of electric power networks.

In 1957, a similar network analog calculator was delivered to the People's Republic of China and has since been reproduced there in several models.

55. Automatic Photoelectric Regulator

"Transducer With Photoelectric Device for Floating Regulation," by B. S. Nanaziashvili, B. M. Plyushch, V. O. Sarkisyan, and B. A. Kulivov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 1, Jan 60, pp 139-142

At the Chair of Electric Drives of the Azerbaydzhan Institute of Petroleum and Chemistry imeni Azizbekov, a photoelectric integrator was developed which ensures a very simple floating regulation and permits varying at will the degree of regulating action in proportion to the error signal. This device can integrate with great accuracy error signals of duration as high as 100 sec.

The photoelectric pressure transducer incorporates both a differential meter and proportional converter. The photoelectric integrator can be used in a number of automatically controlled systems; it can also be used to simulate systems having a relatively large time constant.

56. Electrical Simulation of Nuclear Reactors

"Experiment in Simulating Criticality of a Nuclear Reactor With Static Electric Integrators," by N. U. Isayev and A.T. Luk'yanov; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR, Seriya Energeticheskaya, No 2 (16), 1960, pp 122-129

The article describes the calculation of nuclear reactor criticality with the aid of static electrical integrators. The work was carried out at the Chair of General Physics, Kazakh State University, under the direction of Prof L. A. Vulis.

The electrical simulation of the neutron-transfer process consists in representing the investigated reactor by an electrical analog in which the electric potential is a relative function of dimensionless coordinates and time, resembling the neutron flux in the actual reactor. It was shown that with the aid of static electric integrators it is possible to find with sufficient accuracy the criticality of nuclear reactors of both flat and spherical shape.

It is believed that it will be possible in the near future to simulate reactor kinetics, taking into account changes in the reactor parameters coming out of the critical state. Perfecting the solution of two and three dimensional problems with the aid of static electric integrators will be of great importance because solution by analytical methods is not always possible.

57. Polish Pocket-Size Dosimeter Constructed

(Untitled and unsigned article); Zolnierz Wolnosci, Warsaw, 9-10 Jan 60, p 3

Brief item reports the construction of a pocket-size dosimeter, called the R.I.K.-59, by Janusz Droszcz, master of engineering and chief engineer at the Tele- and Radiotechnology Institute (Instytut Tele- i Radiotechniki) in Bydgoszcz. The dosimeter reportedly is designed to detect gamma and beta radiation originating from concealed or unknown radioactive sources. It is to serve primarily as individual equipment for geological parties and scientists, as well as for detecting contaminated regions. The dosimeter, contained in an aluminum case, detects radiation without determining its absolute value.

58. Rumanian Paper on Double Cathode Effect Read at East German Conference

"On the Explanation of the Mechanism of the Double Cathode Effect," by E. Badareu, I. Popescu, and I. Iova, Physics Institute, Academy of Sciences Rumanian People's Republic, Bucharest; Leipzig, Annalen der Physik, Vol 5, No 5/6, 1960, pp 308-326

This paper, which was delivered at the conference of the German Physics Society in Leipzig on 17 April 1959, reports a series of theoretical and experimental results on the processes which take place in glow discharges in argon at double and simple cathodes. The role played by the resonance change of charge in the kinetics of the positive ions in specific gases, particularly in the theory of the cathode drop, is emphasized. It is shown that, at least in the case of anomalous discharges, most excitations and ionizations in front of the cathode take place in negative light and that this formation represents a practically equipotential plasma which is permeated and supported by primary electrons.

59. Characteristics of Ferrites at Higher Power Levels

"On the Theory of Nonlinear Phenomena in Ferrites at Super-High Frequencies. Part II. Parametric Phenomena in Ferrites," by Ya. A. Monosov; Moscow, Radiotekhnika i Elektronika, Vol 5, No 2, Feb 60, pp 278-287

Parametrically coupled magnetostatic oscillations of a ferrite sample, described in the first part of this work (Radiotekhnika i Elektronika, Vol 5, No 1, Jan 60, p 59), are used in explaining nonlinear phenomena in ferrites at high power levels. It is shown that equations for the amplitude of oscillations in ferrites correspond to the equations for currents in circuits which are coupled through variable parameters. Formulas are obtained for the amplitudes of coupled oscillations, for conditions of complete damping compensation of coupled oscillations, for the compensation frequency band, and for the width of the region of additional absorption at the auxiliary power frequency.

A rough calculation using the derived formulas shows that the magnitude of auxiliary power required to completely compensate for attenuation of oscillations in garnet-structured ferrites ($2 \Delta H \simeq 1$ oersted) is on the order of one watt.

60. General Criteria To Be Applied in the Search for New Piezoelectrics

"Concerning Some Problems of the Crystal Chemistry of Piezoelectrics," by I. S. Rez; Moscow, Kristallografiya, Vol 5, No 1, Jan/Feb 60, pp 63-70

On the basis of experimental data obtained in the search for new piezoelectrics, general criteria are set up which will aid in the discovery of new substances of this class. Eighteen groups of substances are enumerated which appear promising from the standpoint of quantitative electrophysical investigation aimed at finding new piezoelectrics. From experimental data obtained in the testing of inorganic substances for piezoelectric properties, it follows that the substances which exhibit a piezoelectric effect apparently have an easily deformable structural arrangement of atoms; that compounds with covalent bonds, particularly coordination compounds, are more likely to exhibit piezoelectric activity than substances of other types; and that upon isomorphous substitution, the piezoelectric effect which is due to structure is preserved, being modified depending on the properties of the substituent atom or radical.

61. Dresden Institute for the Applied Physics of Pure Materials

"What All's To Be Seen at the Fair," by E. Rexer, Institute of Applied Physics of Pure Materials, Dresden; Dresden, Saechsische Zeitung, 29 Feb 60, p 4

This institute was founded in 1956 and reached its full working capacity in mid-1959. It is engaged primarily in basic research on pure materials, particularly for semiconductors and nuclear-energy applications.

The institute produces, by physical methods, small quantities of pure materials, mostly pure metallic materials. Special installations are being designed and built at the institute also. A zone-melting installation with electronic heating and melting was developed at the institute and put into operation on 1 October 1959.

Since financial problems are involved in the production of pure materials, a special working group at the institute is using radioactive isotopes to test various chemical and physical production methods.

A method of producing pure silicon, developed by the institute, has been taken over by the production facility, VEB Freiberg Spurenmetalle (trace metals enterprise). The silicon produced in Freiberg will be used by the semiconductor producing plant now under construction at Frankfurt/Oder.

The State Planning Commission has designated the Institute for Applied Physics of Pure Metals the "technical-scientific center for radiochemistry in East Germany." It is one of the tasks of the institute to coordinate all research work in the radiochemical field in East Germany.

[For additional information, see Chemistry, Industrial Chemistry, and Radiochemistry.]

Wave Propagation and Antennas

62. Broadband Television Antenna

"High-Gain Broadband Receiving TV Antenna," by L. Minash; Moscow, Radio, No 3, Mar 60, pp 50-51

With the increase of television channels to 12, a need arose for broadband antennas capable of receiving signals in a frequency range of 49 to 230 Mc. A radically new type of TV antenna is suggested consisting of a radiator with logarithmic-periodic dependency of its parameters.

The principle of the performance of this new type of antenna is that each element of the two branches (arms) responds only to a certain specific frequency band. The number of such elements and their parameters may be selected in such a manner that for all the given frequency bands the antenna input impedance and the directivity pattern will be practically constant. The dipoles of the two branches can be made of 20-mm, aluminum, thin-walled tubing. The gain of such an antenna is about four times greater than the gain obtained with a symmetrical dipole. The antenna input impedance is about 120 ohms, and the traveling-wave ratio is about 0.5.

63. Electromagnetic Systems of the Proton-Synchrotron

"The Power Supply System of the Proton-Synchrotron Magnet at the Joint Institute for Nuclear Research," by M. A. Gashev, Ye. G. Komar, N. A. Monoszon, F.M. Spevakova, and A. M. Stolov; Moscow, Elektrichestvo, No 1, Jan 60, pp 6-10

The article describes the magnet power-supply system of the proton-synchrotron (synchrophasotron) at the Joint Institute for Nuclear Research at Dubna. The magnetic field of this proton-synchrotron reverses at a rate of five times per minute. The magnet power-supply system has the following characteristics: maximum power, 140,000 kw; maximum current, 12.8 ka; maximum voltage, 11 kv; energy stored in magnetic field, $148 \cdot 10^6$ joules; and losses in electromagnet winding, 4,000 kw.

At the instant the electromagnet winding is connected to a dc voltage source, the current begins to rise in accordance with an exponential law with a time constant of 25 sec. After the current reaches the value of 12.8 ka, the polarity of applied voltage is reversed, and the current begins to drop. The dc voltage source consists of an induction-motor driven synchronous generator and an electronic rectifier. Because of the high power capacity of the system, it was found expedient to break it up into four identical units operating in parallel; each unit consists of a power-generating set and an electronic rectifier. The power-generating set consists of a 2,500-kw, 6-kv, 744-rpm induction motor, a 37,000-kw, 8.2-kv, 750-rpm synchronous generator, and a 200-kw, 400-v, 750-rpm auxiliary generator. The power-generating set has a 56-ton fly-wheel. The All-Union Electrical Engineering Institute has designed special hermetically sealed type IVU - 100/1,500 pentode-ignitrons operating at a rated current of 100 a and reverse voltage of 15 kv.

To ensure uniformity of the magnetic field and to reduce residual magnetism, the demagnetizing pulses are generated by two type IVU- 100/1,500 ignitrons. Demagnetization is carried out by five pulses of 980, 790, 600, 440, and 390 a each and for a total duration of 4.9 sec.

The system has proven its stability and flexibility during a prolonged period of actual operation.

64. Flat-Type Induction Pump

"Electromagnetic Phenomena in Flat Type Induction Pumps for Molten Metal," by N. M. Okhremenko; Moscow, Elektrichestvo, No 3, Mar 60, pp 48-54

Electromagnetic pumps are used to circulate molten-metal coolant in certain types of nuclear reactors. The flat-linear type of induction pumps shows great promise due to the simplicity of its construction and ability to draw power from conventional 3-phase power lines.

The principle of operation of such a pump is as follows: the 3-phase winding on the stator core creates a traveling magnetic field which induces current in the molten metal placed in a gap between the cores. The flow of molten metal along the longitudinal axis is caused by the interaction of the traveling field and the induced current.

At the Physics Institute of the Latvian Academy of Sciences, a series of studies on the theory and practice of electromagnetic pumps was carried out under the direction of I. M. Kirko and I. A. Tyutin. A. I. Vol'dek also contributed substantially to the theory of induction pumps. Yet, a considerable number of problems relating to the performance of induction pumps are still unsolved, such as accounting for the mutual effect of transverse and longitudinal fringe effect and the demagnetizing effect of the current in the metal on power loss and pressure drop in the pump, determination of the equivalent parameters of the secondary circuit, etc.

The author tries to generalize the theory of performance of an induction pump, taking into account various secondary effects.

65. Lowering Insulation Standards on High-Voltage Networks

"Requirements With Regard to Arresters and Circuit Breakers on High-Voltage Networks With Lowered Standards of Insulation," by M. M. Akodis, Ural Polytechnic Institute imeni S. M. Kirov; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 1, Jan 60, pp 1-10

The tendencies for the past few years to lower considerably the standards for insulation on high-voltage power networks of 110 kw and higher have resulted in a need for more careful and detailed study of internal overvoltages and methods of protection against them. Under conditions of lowered standards for insulation on high-voltage power networks, the most dangerous internal overvoltages arise during switching-on and -off of the unloaded lines and disconnecting open-circuit transformers. To ensure safety with such lowered insulation standards, it is considered necessary to install arresters with reduced discharge voltage on the power lines and substations.

The author concludes that to prevent any damage to the circuit-breakers and the substation insulation during the disconnection of the unloaded lines, the circuit breakers, at least those 220 kw and higher, should be executed in such a manner that the probability even for a single repetition of an arc, later than 90° after extinction, should be insignificantly low.

66. New Speedy Method of Hydroelectric Station Construction

"Hydraulic Station in Two Years," by Yarosh; Moscow, Yunyy Tekhnik, No 3, 1960, pp 22-25

Engr N. M. Ivantsov, in cooperation with the All-Union Trust for the Design and Planning of Hydroelectric Power Plants and Hydroelectric Development (Gidroenergoproyekt), has developed a new rapid method of dam construction with prefabricated concrete structural elements. Only the foundation of the dam will be monolithic concrete; the superstructure will be assembled from 12,550 prefabricated structural elements (beams, plates, etc.). These 12,550 structural concrete elements comprise only 6 basic structural types. The individual structural elements are fastened to each other by welding the protruding ends of the reinforcing bars; the welded joints are later imbedded in concrete.

This new type of hydroelectric station does not require a spillway dam; the flood water is carried away through the spillway passages under the dam. Such a dam with prefabricated structural elements is now being built near the city of Saratov; it will have a capacity of one million kw and will have a water head of 15 m.

The completion of the Saratov Hydroelectric Power Plant should mark a turning point for the future design of hydroelectric power plants. Instead of the 5-8 years needed for the construction of a similar plant by conventional methods, the Saratov Hydroelectric Plant will be built in only 2 years.

67. Design of Large Gas Turbines

"Gas Turbine Units of the Leningrad Metal Plant for Electric Stations," by L. D. Frenkel'; Moscow, Energomashinostroyeniye, No 2, Feb 60, pp 1-6

A 100,000-kw gas turbine, designated GT-100-750, is now in the process of design at the Leningrad Metal Plant. This turbine will operate on natural gas or crude petroleum. The over-all efficiency is expected to be about 37%, the initial temperature of inlet gases

will be 750°C, and the weight of metal per kw of rated capacity will be 15 kg and that of the austenitic steel will be 0.35 kg. Cooling water circulation for each turbine will be 6,000 cubic meters per hr; the back-pressure at the exhast of the low-pressure turbine will be 1.08 atm abs. The internal efficiency for both high- and low-pressure turbines will be 89%, efficiency of the combustion chamber will be 98%, efficiency of the electric generater will be 99%, mechanical efficiency of the turbine will be 99%, and efficiency of the compressors will be 97%. The pressure at the compressor outlet will be 20.3 atm abs, pressure at the turbine inlet will be 19.3 atm abs, and pressure at the exhaust of the high-pressure turbine will be 6.3 atm abs. Temperature of the gas at exhaust will be 420°C, and temperature of the air after the regenerator will be 357°C. Fuel consumption at the high-pressure combustion chamber will be 12,580 kg per hr, and fuel consumption at a low-pressure combustion chamber will be 7,525 kg per hr. The last blades of the low-pressure turbine will be 500 mm long. The number of stages in the high-pressure turbine will be 4, and in each branch of the double-flow, low-pressure turbine, 6.

Applied Mathematics

68. Successive Approximations in Calculating Buckling of Shells

"Use of Similarity Notions for Improving Convergence During Successive Approximations in the Calculation of Shells," by I. V. Svirskiy, Kazan'; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 134-143

This article is a further development of a previous work (Svirskiy, I. V., "Some Variations of the Method of Successive Approximations and the Perturbation Method," Izvestiya Kazanskogo Filiala AN SSSR, No 12, 1948, pp 29-41), and is based in part on the work of a Chinese scholar (Chien, W. Z., "Large Deflection of a Circular Clamped Plate Under Uniform Pressure," Chinese Journal of Physics, Vol 7, No 2, 1947), where buckling is determined by breaking down the load into a series according to degrees of buckling at the center of circular plates, and in part on the work of Kh. M. Mushtar (Izvestiya Kazanskogo Filiala AN SSSR, Seriya Fiziko-Matematicheskikh Nauk, No 12, 1958, pp 53-62) on the semi-nonlinear approach to the problem of the buckling of plates, wherein the nonlinear equations are linearized in relation to the highest harmonics of buckling in the amplification factor and where the nonlinearity in relation to the main harmonic of buckling with the greatest amplitude is taken into account. This makes it possible to locate the main regions of nonlinearity, which are related to the most extensive bucklings, and greatly facilitates the calculations.

At each step of the successive approximations used here, the equations are comparatively well satisfied with respect to the main harmonics of greatest amplitude; the determination of the highest harmonic of buckling and of the amplification factor leads to the solution of the linear equations; since the highest harmonics generally are small and their frequency high, the author, in determining them, neglects the bending of the shells and whatever nonlinearities may occur.

The methods reported here can be used without alteration for the determination of the buckling of shells subjected to longitudinal edge loads. The use of the perturbation method and of the method of successive approximations in longitudinal loading without the use of the theorem of similarity for improving convergence is discussed in other works (Polubarinova-Kochina, P. Ya. Prikladnaya Matematika i Mekhanika, Vol 20, No 1, 1956; Alekseyev, S. A., Prikladnaya Matematika i Mekhanika, Vol 20, No 6, 1956, pp 673-679).

69. Integration of Equations of Nonsteady Creep in Solids

"On the Integration of the Equations of Nonsteady Creep of Solid Bodies," by P. S. Kuratov and V. I. Rozenblyum, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 146-148

The determination of the increments of stress and strain with respect to time is reduced to the original linear problem, which, in many ways, is analogous to the problem of thermal elasticity. The calculation of the nonsteady (initial) creep of solids is thus reduced to a determination of such increments for successive, small intervals of time.

For the case of the uniform stress state (for example, in the problem of the relaxation of stress in a shaft), the mathematical procedure given here amounts to a numerical integration of the original equations by the Euler method.

70. Survey of the Scientific Works of Nikolay Gur'yevich Chetayev (1902-1959)

"Survey of the Scientific Works of N. G. Chetayev" (unsigned article); Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 171-200

A summary of the most important aspects of the work of Chetayev in analytical dynamics, theory of stability of motion, mathematical physics, and the theory of differential equations is given. A 67-item chronological bibiliography of Chetayev's published works is appended.

71. Theorem of Stability of Motion of a Limited Volume of a Continuous Medium

"A Theorem on the Stability of a Motion," by V. V. Rumyantsev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 47-54

An arbitrary holonomic mechanical system is considered, whose independent Lagrange coordinates and general velocities are given. It is assumed that the equations of motion of the system have a certain partial solution which relates to the so-called unperturbed motion of the system under consideration. Expressions are given for the unperturbed and the perturbed motions.

The theorem can be applied effectively for the second method of Lyapunov in solving the problem of stability of motion of a continuous medium with respect to a finite number of parameters of integral form which characterize the motion of the medium.

72. Random Perturbations in Optimal Control

"On Optimum Control During Random Perturbations," by N. N. Krasovskiy, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 64-79

The problem of optimal control is considered for the case of a minimum expected time of decay of a transient process. The application of the method of the Lyapunov functions to this problem is described. The approach to the problem here generalizes certain problems of optimal rapid response in systems subjected to random perturbations. Approximate methods of designing optimal control are considered.

73. Motional Instability of a System With Time Delay

"On the Instability of the Motion of a System With a Delay With Respect to Time," by S. N. Shimanov, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 55-63

This work shows that the well-known theorem of Lyapunov (Obshchaya zadacha ob ustoychivosti dvizheniya [The General Problem of the Stability of a Motion], Moscow-Leningrad, 1950) and the theorem of Chetayev (Ustoychivost' Dvizheniya [The Stability of Motion], 2d edition, Moscow-Leningrad, 1956) can be transferred to the case of a system having delay with respect to time. First approximation criteria are given for the instability of motion of the system.

74. Limit of Application of Integral and Variational Principles of Mechanics

"On the Application of Integral and Variational Principles of Mechanics in Problems of Oscillations," by G. Yu. Dzhanelidze and A. I. Lur'ye, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 80-87

This article considers the problem of the possibility of using variational and integral principles for the determination of frequencies and forms of the oscillations of elastic systems and shows that the Hamilton-Ostrograd principle, with varied formulation, makes it possible

to apply the problem to the study of the stationary values of a certain functional, but does not permit a conclusion regarding the character of its extremum. The latter should be drawn on the basis of an independent investigation not connected with the variational and integral principles of mechanics.

Pure Mathematics

75. Riemann's Boundary Value Problem Effectively Solved

"An Approximate Solution of Riemann's Boundary Value Problem for Systems of n Pair Functions," by V. V. Ivanov, Computer Center, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 1, Nov 59, pp 27-29

It is known that up to now an effective approximate algorithm for the solution of the problem indicated in the title has not been found (see N. P. Vekua, Sistemy singulyarnykh integral'nykh uravneniy (Systems of singular integral equations), Moscow-Leningrad, 1950, and F. D. Gakhov, Usp. matem. nauk, Vol 7, No 4 (50), 1952). In addition, several reports were presented in the work by B. V. Boyarskiy, Soobshch. AN Gruz SSR, Vol 21, No 4, 1958, showing that any algorithm for the solution of the problem obtained with the help of "ordinary" means is not satisfactory from a practical point of view.

In the present work, an approximate method for finding all the solutions of a homogeneous Riemann boundary value problem for systems of n pair functions is found. The method may be cumbersome, but it is nevertheless, effective.

76. Approximation of Continuous Functions in Hilbert or Reflexive Banach Spaces

"Several Theorems Concerning the Best Approximation by Unbounded Operator-Functions," by S. I. Zukhovitskiy and G. I. Eskin; Moscow, Izvestiya Akademii Nauk SSSR Seriya Matematicheskaya, Vol 24, No 1, Jan/Feb 60, pp 93-102

The questions for existence and uniqueness of a best approximation for a continuous function with values in a Hilbert or reflexive Banach space are investigated with the help of a closed operator-function.

77. New Notion of a Polynomial for Best Asymptotic Approximation Presented

"Some Asymptotic Properties of Polynomials," by P. K. Suyetin, Ural'sk Pedagogical Institute imeni A. S. Pushkin; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 1, Nov 59, pp 30-33

In the work by P. K. Suyetin (DAN, Vol 114, No 3, p 498, 1957), asymptotic formulas for generalized Faber polynomials and for polynomials orthogonal to the boundary were established in which the remainder term is estimated as a function of the differential properties of the weighting function and smoothness of the boundary.

In the present work, the problem concerning the accuracy of the mentioned asymptotic formulas is considered. Also introduced is a new notion of a polynomial of the best asymptotic approximation.

78. Classification of Magnetic Fields by Groups of Motions

"Classification of Magnetic Fields of a General Form According to Groups of Motions. Part 2," by A. Z. Petrov, V. R. Kaygorodov, and V. N. Abdullin, Kazan' State University imeni V. I. Ul'yanov-Lenin; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 1 (14) Jan/Feb 60, pp 175-187

The work is a continuation of the work by the same authors appearing in Izv. vuzov, Matem. No 6, 1959. In the present work, a classification of the Riemannian spaces V_4 is made which admits the group of motions G_3, operating on nonisotropic (V_3) or isotropic (V_3^*) hypersurfaces of transitivity. The metrics of the spaces answering to the gravitational fields and satisfying the corresponding group of motions is obtained from the metrics cited in the work if the auxiliary condition $|g_{\alpha\beta}| \neq 0$ is places on them. To make the joint reading of the first part and the present part easier, the same terminology, notation, and paragraph numeration are continued. The investigation is conducted in the class of analytical functions.

79. Construction Theory for Real Conic Sections in the Lebachevskiy Space L_2

"Complete Classification of the Real Conic Sections in an Extended Hyperbolic Plane," by I. Sh. Epshteyn, Yaroslavl' Pedagogical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 1 (14), Jan/Feb 60, pp 234-243

Coolidge, in his work The Elements of Non-Euclidean Geometry, Oxford University Press, London, 1927, using the projective theory of curves of the second order, developed a detailed theory of conic sections for the Lobachevskiy space L_2. All constructions proposed by him were performed on a Cayley-Klein analog, and all 12 conic sections were obtained. An analytical theory for the extended hyperbolic plane $\overline{L}_2$ was given by V. F. Kagan in his book Osnovaniya Geometrii Ch 2 (Fundamentals of Geometry, Part 2), Chapter 8, GITTL, Moscow, 1956. All of the characteristic curves of the second order and only five ideal curves were indicated in the work. A synthetic method of exposition for the theory of conic sections on L_2 with the help of cyclographs was given in the work by Z. Z. Skopets, Osnovy nachertatel'noy geometrii prostranstva Lobachevskogo (Fundamentals of the descriptive geometry of the Lobachevskiy space). The work is in the collection Metody nachertatel'noy geometrii i yeye prilozheniya (Methods of descriptive geometry and its application), Gostekhizdat, 1955, p 331. In the present work, a new synthetic method concerning the construction theory of real conic sections in $\overline{L}_2$ is presented. Their complete classification is also given.

80. Residues of the Poles for Solutions of the Second Equation of Painleve

"Concerning the Residues of the Poles of the Solutions for the Second Equation of Painleve," by A. I. Yablonskiy; Minsk, Doklady Akademii Nauk BSSR, Vol 4, No 2, Feb 60, pp 47-50

Let the second equation of Painleve

$$w'' = 2w^3 + zw + \alpha, \qquad (1)$$

be given where α is an arbitrary parameter. Any solution of this equation different from $w \equiv 0$ has poles, and the residue of each pole is equal to 1 or -1. These solutions do not have other singular points on a finite portion of the z plane.

In the work by N. P. Yerugin, "On the Second Transcendental of Painleve," DAN BSSR, Vol 2, No 4, 1958, it is established that for $\alpha = \pm \frac{1}{2}$, all solutions of the Riccati equation

$$w' = \pm (w^2 + \frac{z}{2}) \qquad (2)$$

are solutions of equation (1). Each solution of equation (2) has an infinite number of poles. The residues of these poles are of one sign.

In the work by A. I. Yablonskiy, "On the Rational Solutions of the Second Equation of Painleve," Izv. AN BSSR, ser. fiz.-tekhn., No 3, 1959, it is proved that except for the rational solutions $w = 0$ and $w = \pm \frac{1}{2}$, all other rational solutions have poles with the residue 1 and well as the residue -1.

In the present work, the problem concerning the number of poles with residues 1 and -1 is solved for any solution of the equation (1). The result is formulated by the following theorem:

Theorem. For any α every solution of (1), different from rational solutions of equation (2), has an infinite number of poles with residue 1 as well as with residue -1. The number of positive residues of the poles for rational solutions is determined by the formula $p = \frac{\alpha(\alpha-1)}{2}$, and the number of negative residues are determined by $n = \alpha \frac{(\alpha+1)}{2}$. Each solution of equation (2) has an infinite number of poles. The residues of all poles of any such solution are of one sign: 1 for $\alpha = -\frac{1}{2}$, -1 for $\alpha = \frac{1}{2}$.

81. Logarithmic Mean Method for Summing Fourier Series

"Concerning the Class of Saturation for the Logarithmic Mean Method of Summing Fourier Series," by A. Kh. Turetskiy; Minsk, Doklady Akademii Nauk BSSR, Vol 4, No 3, Mar 60, pp 95-100

The "logarithmic" mean method for summing series consists of the following:

Let the series

$$\sum_{k=0}^{\infty} A_k \tag{1}$$

be given and let

$$S_k = \sum_{i=0}^{k} A_i \qquad (k = 0, 1, 2, \ldots)$$

be the sequence of its partial sums. We will call the sequence

$$t_n = \frac{S_0 + \frac{S_1}{2} + \ldots + \frac{S_n}{n+1}}{1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{n+1}} = \frac{1}{P_n} \sum_{k=0}^{n} \frac{S_k}{k+1},$$

$$P_n = \sum_{k=1}^{n+1} \frac{1}{k} \qquad (n = 0, 1, 2, \ldots)$$

the sequence of logarithmic means for the series (1).

One may also represent the quantity t_n in the form

$$t_n = \sum_{\nu=0}^{n} \gamma_\nu(n) A_\nu ,$$

where

$$\gamma_\nu(n) = \frac{1}{P_n} \sum_{k=\nu+1}^{n+1} \frac{1}{k}. \tag{2}$$

A given continuous periodic function f (x) of period 2π having the Fourier series

$$f(x) \sim a_0/2 + \sum_{k=1}^{\infty} (a_k \cos kx + b_k \sin kx)$$

is approximated by trigonometric polynomials of the sequence

$$T_n^{\gamma} = a_0/2 + \sum_{k=1}^{n} \gamma_k(n) (a_k \cos kx + b_k \sin kx), \tag{3}$$

where the $\gamma_k(n)$ are defined by the formulas (2).

In the present work, the definition of the saturation method and the class of saturation given in the work by A. Kh. Turetskiy, DAN BSSR Vol 3, No 4, 1959, (for $\gamma=0$) is employed.

Thus, for the present method of summation for a fixed k and for $n\to\infty$,

$$1-\gamma_k(n) = \frac{1}{P_n}\sum_{i=1}^{k}\frac{1}{i} \sim \frac{1}{\ln n}\sum_{i=1}^{k}\frac{1}{i}, \qquad (4)$$

and on the basis of theorem 1, of the above-mentioned work, the process of approximation with the help of logarithmic means is saturated with an approximation of order $O\left(\frac{1}{\ln n}\right)$. The set of continuous periodic functions f(x), different from a constant, for which

$$\left| T_n^{\gamma}(x) - f(x) \right| = O\left(\frac{1}{\ln n}\right), \qquad (5)$$

where $T_n^{\gamma}(x)$ is defined by formula (3), is the class of saturation for this method. Functions satisfying (5) are contained in the class of functions satisfying the condition

$$E_n(f) = O\frac{1}{(\ln n)}, \qquad (6)$$

where $E_n(f)$ is the best approximation of the function f(x) by trigonometric polynomials of an order not exceeding n.

The following assertion is correct for the previous class of functions. In order for (6) to hold, it is necessary and sufficient that a constant $A>0$ exists so, that for all real x and values of h in the interval $0 \leq h \leq 1/2$, the condition

$$\left| f(x+h) + f(x-h) - 2f(x) \right| \leq \frac{A}{|\ln h|}$$

is satisfied. This assertion follows from two theorems proved by S. B. Stechkin, Izv AN SSR ser Matematich, Vol 15, No 3, pp 219-242, 1951, theorems 1 and 8, and from A. F. Timan and M. F. Timan, DAN SSSR, No 17, pp 17-20, 1950.

For that reason, it is assumed here that f(x) satisfies (7) in the future. The class of saturation for the method of summation is determined by the following theorem with the help of logarithmic means. The proof of the theorem comprises the remainder of the work.

Theorem. For any continuous periodic function f(x) of period 2π to satisfy (5), it is necessary and sufficient that the integral

$$\int_{\epsilon}^{1/2} \frac{f(x+t) + f(x-t) - 2f(x)}{t}\, dt$$

be uniformly bounded with respect to x and $\epsilon>0$.

82. Mapping of Dynamic Systems

"Concerning the Mapping of a Dynamic System Into a Dynamic System Analytic With Respect to Time," by Ye. A. Barbashin and F. A. Sholokhovich, Ural Polytechnic Institute imeni S. M. Kirov, Ural State University imeni A. M. Gor'kiy; Kazan' Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 1 (14), Jan/Feb 60, pp 11-15

"The problem concerning a topological mapping of more or less general dynamic systems into a system with certain special properties, in particular, into the system of solutions of differential equations, has been studied by a series of authors. We mention the works of M. V. Bebutov, ("On Mapping the Trajectories of a Dynamic System on the Family of Parallel Straight Lines," Byulleten' MGU, Matem., Vol 2, No 3, 1941; "Concerning Dynamic Systems in the Space of Continuous Functions," Byulleten' MGU, Matem., Vol 2, No 5, 1941), M. I. Grabar' ("Mapping of Dynamic Systems Into the System of Solutions of Differential Equations," DAN SSSR, Vol 61, No 3, 1948; "Mapping of Dynamic Systems Into the System of Solutions of Differential Equations" Vestnik MGU, ser. Fiziko-Matem. i Yestyest. Nauk, Vol 3, No 2, 1952), and the work in which M. I. Grabar' solves the important problem presented by V. V. Nemytskiy and F. A. Sholokhovich ("On the Relation Between a Linear Dynamic System and a Differential Equation in the Banach Space," DAN SSSR, Vol 120, No 1, 1958). The present work is devoted to that problem.

"Let the dynamic system $f(p, t)$, $p \in L$; $-\infty < t < +\infty$ be given in a normalized linear space. We will call the dynamic system $f(p, t)$ analytic if there exists a mapping $f(p, t)$ in a series convergent with respect to the norm:

$$f(p_o, t) = p_o + p_1 t + \ldots + p_n t^n + \ldots, \qquad (1)$$

where $p_n \in L$ $(n = 0, 1, 2, \ldots)$, $p_1, p_2, \ldots, p_n, \ldots$ do not depend on t and are defined only at the point p_o which may be arbitrarily taken in the space L. If the series (1) converges for all $t \in (-\infty, \infty)$, then we will say that the dynamic system is whole with respect to t. The following theorem is proved in the present work: Any compact dynamic system having not more than one singular point or locally compact dynamic system without singular points (space of a Hausdorf system and satisfying the second axiom of denumerability) satisfies a topological mapping into the dynamic system whole with respect to t."

83. Spectral Theory of Symmetric Linear Operators

"Characteristic Functions of Linear Operators," by A. V. Shtraus; Moscow, Izvestiya Akademii Nauk SSSR Seriya Matematicheskaya, Vol 24, No 1, Jan/Feb 60, pp 43-74

Characteristic functions of a given arbitrary dense linear operator with a nonempty set of regular points are considered. In terms of characteristic functions, the conditions for a unitary equivalence of nonself-conjugate operators and results pertaining to the spectral theory of symmetrical operators are formulated.

84. New Theorems Concerning Inhomogeneous Generalized Functions of Two Variables Proved With Weaker Assumptions

"Inhomogeneous Generalized Functions of Two Variables," by M. V. Fedoryuk; Moscow, Matematicheskiy Sbornik, Vol 49 (91), No 4, Oct/Dec 59, pp 431-446

In the work of I. M. Gel'fand and Z. Ya. Shapiro, integrals of the form

$$I(\lambda) = \int_{P>0} \cdots \int P(x_1, \ldots, x_n)\, \varphi(x_1, \ldots, x_n)\, dx_1 \ldots dx_n,$$

are considered where λ is a complex number, $P(x_1, \ldots, x_n)$ are polynomials, and $\varphi(x_1, \ldots, x_n)$ is a finite function infinitely differentiable. It is proved that $I(\lambda)$ is a meromorphic function of λ, the poles of which are distributed on a finite number of arithmetic progressions. However, this is proved under the assumption that all singular points of the surface $P(x_1, \ldots, x_n) = 0$ are reducible (see paragraph 4 of the above mentioned work).

In the present work, we free ourselves from this assumption, however, only for the case of two variables. The results of the present work are the three theorems:

Theorem 1, Let

$$P(x, y) = \sum_{k, j = 0}^{\infty} a_{kj} x^k y^j, \qquad (1)$$

$P(0, 0) = 0$, and let the series (1) converge in a certain neighborhood of U, the origin of coordinates, and be positive at U for $(x, y) \neq (0,0)$; let $\varphi(x, y) = 0$ within U and be infinitely differentiable. Then

$$I(\lambda) = \iint P^{\lambda}(x, y)\varphi(x, y)\, dxdy$$

is a meromorphic function of λ, the poles of which are distributed on a finite number of arithmetic progressions having the form

$$\lambda_k = -\frac{k + m}{2n},$$

k, m, n are natural numbers; all poles are prime with the exception of the points of intersection of the progressions, where there may be double poles.

Theorem 2, Let there be given

$$I(\lambda) = \iint_{x>0, y>0} x^{a\lambda+b}\, y^{c\lambda+d}\, P^{\lambda}(x, y)\varphi(x, y)\, dxdy,$$

where $P(x, y) > 0$ for $x > 0$, $y > 0$, and let P be expanded in a series of type (1); a, b, c, and d are natural numbers. Then $I(\lambda)$ is a meromorphic function of λ, the poles of which are distributed on a finite number of arithmetic progressions of the form

$$\lambda_k = -\frac{k + m}{n},$$

where k, m, and n are natural numbers; all poles are prime with the exception of the points of intersection of the progressions where there may be double poles.

Theorem 3, Let $P(x, y)$ be a mononomial; then

$$I(\lambda) = \iint_{P>0} P^{\lambda}(x, y)\varphi(x, y)\, dxdy$$

is a meromorphic function of λ, the poles of which are distribued on a finite number of arithmetic progressions of the form

$$\lambda_k = -\frac{k + m}{n},$$

k, m, and n are natural numbers; all poles are prime with the exception of the points of intersection of the progressions where there may be double poles.

85. Asymptotic Representations for Generalized Fourier Integrals

"Asymptotic Representations for Generalized Fourier Integrals," by L. Berg, Ilmenau; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 166-170

An earlier work (Mathematische Nachrichten, Vol 17, 1958, pp 101-135) investigated the asymptotic behavior of parametric integrals, whereby the integrand was written in the form exp $\{-g(s,t)\}$. Theoretically, any function of two variables can be written in this form; but, in a practical execution, the result would appear very artificial in many cases. The function $g(s, t)$ in the earlier work must also satisfy certain assumptions which are by no means always automatically satisfied. This article derives the necessary asymptotic representation for other cases in which the integrand is not given in the above form, without previously transforming the integrand.

86. Closed Linear Transformations in Banach Space

"Perturbation Theory of Isolated Eigenvalues for Closed Linear Transformations in Banach Space," by G. Porath (1958 University of Greifswald Dissertation); Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 175-230

This thesis presents a generalization of the main results of perturbation theory for a simple type of transformation in a Banach space. Let T_o and T_1 be linear transformations in a Banach space B with the common range of definition D and let T_o be closed in D. The linear transformation

$$T(\varepsilon) = T_o + \varepsilon T_1$$

is considered, when the inequality

$$\| T_1 F \| \leq H(\| f \| , \| T_o f \|)$$

applies for $f \in D$ with a suitable constant function $H(\xi, \eta)$. The spectrum of T_o contains an isolated point z_o. $T(\varepsilon)$ is then closed in a neighborhood of $\varepsilon = 0$, and the spectrum of $T(\varepsilon)$, within a certain neighborhood of z_o, consists of an isolated part $\sigma(\varepsilon)$, which contracts in the direction of point z_o for $\varepsilon \longrightarrow 0$.

The linear transformation T (ε) is investigated for the following problems:

1. Under what conditions does $\sigma(\varepsilon)$ consist of a regular eigenvalue of T (ε)?

2. What conditions must be set up so that $\sigma(\varepsilon)$ contains a regular eigenvalue of T (ε)?

3. The determination of the appropriate regular eigenelements of T (ε).

4. Estimation of errors and the radius of convergence for the regular eigenvalues and eigenelements.

87. Limiting Theorem of Probability Theory

"On the Question of the Necessity of the Cramer Condition," by W. Richter, Dresden; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 231-238

The Cramer condition ("Sur un nouveau théorème-limite de la théorie des probabilités," Actual. sci. et ind., N 736, 3, 1938, pp 5-23), that the characteristic functions of an observed sequence of random variables must be analytic in a common neighborhood of the origin, was used initially for the derivation of the first general result regarding the limiting behavior of probabilities of large deviations and has since revealed surprisingly simple regularities even in the area of local boundary-value theorems.

This article investigates the extent to which this condition is necessary for the derivation of similar limiting regularities, such as the derivation of the integral boundary value theorem of Cramer or of the local boundary values (Doklady Akad. Nauk SSSR, Vol 115, 1957, pp 53-56. The treatment is limited to the one-dimensional case.

88. Generalizations of the Schubert Criterion

"Generalizations of the Criterion of Mr. H. Schubert," by L. Berg, Ilmenau; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 159-165

In the derivation of asymptotic representations for integrals and series in an earlier work (L. Berg, Mathematische Nachrichten, Vol 17, 1958, pp 101-135), the Schubert criterion from a previous treatment (Wiss. Z. Hochsch. Ilmenau, Vol 3, No 2, 1957) was used with particular advantage for the Laplace transformation and the power series. This criterion, however, does not embrace all important cases; for example, it is not applicable to certain Mellin transformations.

In this article, the Schubert criterion is generalized in order to increase its area of application. It is also further expanded to include complex integrands and infinite series and used, as in an earlier used practical derivation of asymptotic representations (ZAMM, Vol 38, 1958, pp 260-261), in the case of additional factors in the integrand.

89. Cubic Null System Connected With a Euclidean Screw Displacement

"Contributions to the Theory of the Cubic Null System Connected With a Euclidean Screw Displacement," by R. Bereis, Dresden, and H. Brauner, Vienna; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 239-258

For the case of a noneuclidean screw displacement theories have been extensively developed (K. Strubecker, Sitzb. Akad. Wissen. Wien, Vol 140, 1931, pp 545-578) which apply to cubic null systems in which to each space point is ascribed the path osculating plane of the trajectory curve of a screw displacement passing through it. Frey and Strubecker (J. reine angew. Math., Vol 193, 1954, pp 209-238; Ibid., Vol 194, 1955, pp 1-20) have also treated the special case of the Euclidean screw displacement. Among other things, these works present the configuration corresponding to a straight-line point series or to a cluster of planes in the cubic null system, but they necessarily neglect a number of geometric details. The purpose of this article is to close this information gap from the visual-constructive point of view. Several, more marginal, points are also considered, which, however, because of the method involved, are not treated with the comprehensiveness of an analytical formulation.

With every Euclidean screw displacement, a certain point-plane relationship of the third order is associated, the general theory of which has often been discussed. The present contribution to the theory of this relationship, involving primarily methods of constructive geometry, presents an exact study of the configurations which correspond to a straight-line point series and to a cluster of planes, as well as to a certain multiplicity of radii.

90. Fixed Point Theorems Valid in the Euclidean Space Transferred to the Banach Space

"On Fixed Point Theorems and the Theory of the Degree of Mapping in Functional Spaces" (1958 Leipzig University Dissertation), by D. Goehde, Leipzig; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 356-371

J. Schauder (Studia Math. Vol 2, 1930, p 171) proved the fixed point theorem for complete self mappings of convex, compact, and closed sets in the Banach space by considering, in suitable infinitely dimensional subsets, arbitrary exact approximating mappings which possess fixed points in accordance with the Brouwer theorem. This method is employed here to transfer other fixed point theorems which are valid in Euclidean space to Banach spaces. This involves the transfer of the fixed point theorem for the perforated solid sphere and of a fixed point theorem for a topological product, which itself is first proved.

91. Complex Line Integrals Over Nonrectifiable Curves

"Complex Line Integrals Over Nonrectifiable Curves," by L. Berg, Ilmenau; Berlin, Mathematische Nachrichten, Vol 20, No 3/6, Sep/Dec 59, pp 259-264

In textbooks on function theory, line integrals are defined only for rectifiable curves, even though the rectifiability of the integration path is never used in the definition of the line integral. If the integrand is a constant, it is evident that the line integral exists over an arbitrary curve, whether it is rectifiable or not; in this case, the integral is independent of the path of integration. This article investigates the possibility of transferring this factual situation to nonconstant integrands. It is assumed throughout that the integrand is a regular analytical function in a simply connected region G and that the integration path C lies completely within G.

Bacteriology

92. Information on Ultrasound in Microbiology Reviewed

"The Use of Ultrasound in Microbiology and the Biochemistry of Microorganisms," by G. I. Stapanchenok-Rudnik and V. A. Blagoveshchenskiy, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 3, Mar 60, pp 44-48

This survey of Soviet and foreign literature offers proof that the biological and chemical effect of ultrasound disturbs most microorganisms. The form of the microorganism, the simplicity and chemical composition of the cell wall, the presence of a capsule, the age of the culture, the intensity and duration of irradiation, and the frequency of the ultrasonic wave are among the factors on which this effect depends.

According to this survey, the disturbance of microorganisms by ultrasound produces a biologically active complex of microbial cells in an almost unknown form. This introduces the possibility of obtaining antigenic and immunogenic complexes of bacteria without the use of chemical extracting agents which denature these complexes to some extent. Further investigation of the action of ultrasound on bacterial enzymes and protoplasm components, the author suggests, will make it possible to explain the interconnection of biochemical processes which occur in the living cell, particularly with regard to the biosynthesis of biologically active complexes and metabolites in the bacterial cell. Intensive study of the effect of brief exposure of microorganisms to ultrasound on their vital activity is recommended. The author concludes that the study of this problem in connection with investigation of the effects of ultrasound on biochemical processes and physiological functions of the cell will provide a base for the directed culturing of microorganisms.

93. Detection of Botulinus Toxin

"The Use of the Indirect Hemagglutination Reaction for Detecting Botulinus Toxins. Report I. The Observation of Types A and B Botulinus Toxins With the Aid of the Indirect Hemagglutination Reaction (Rytsay Modification)," by V. A. Sinitsyn, Chitinskiy Institute of Epidemiology, Microbiology, and Hygiene; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 3, Mar 60, pp 22-26

Since there is no reliable, specific method of detecting botulinus toxin in various foodstuffs and environmental objects, the author presents the results of his attempts to detect Botulinus A and B toxins by the use of the indirect hemagglutination method proposed by Rytsay in 1956. The toxins were prepared on a medium containing Martin's bouillon, glucose, and white absorbent cotton. One ml of a 2-day culture of Cl. botulinum type A (strain 98) or type B (strain 255) was seeded on this medium and kept at 37° C for 6 days. During this period, the culture was filtered through an asbestos membrane filter. The toxin obtained was titrated in white mice; the amount which killed white mice weighing 10-12 g in 3-4 days were adopted as one MLD. The day after preparation, one MLD of type A toxin was 0.001 ml, and of type B, 0.005 ml. The toxic properties of the preparation diminished rather rapidly thereafter. Serum obtained from the Khar'kov Institute of Vaccines and Sera and purified by the Diatherm-3 method was used as antibotulinus serum. Erythrocytes, normal rabbit serum and immune horse serum and toxin were the basic ingredients for the reaction, which is described in detail.

The specificity of the reaction was determined in 20 experiments with botulinus types A and B toxins and with diphtheria and tetanus anatoxins and the corresponding antisera. The optimum conditions for the reaction were established by studies of the action of various concentrations of tannic acid and specific antibotulinus sera, the significance of different pH values of the physiological solution, and the effect of temperature at different stages of the reaction.

The results of the experiments are discussed and the following conclusions are offered:

"1. The indirect hemagglutination reaction in experiments with botulinus toxins A and B and with homologous and heterologous (anti-diphtheria and antitetanus) sera permitted us to differentiate type A from type B botulinus toxin.

"2. The direct hemagglutination reaction method is more sensitive than the biological test on white mice and makes it possible to obtain a response within 3 1/2 — 4 hours, but further development is necessary since negative results are sometimes obtained with known botulinus toxin even when methodology is precisely observed.

"3. Following the detection of an unknown concentration of botulinus toxin, sensitization of erythrocytes with various doses of antibotulinus serum should be performed.

"4. A temperature of 37° C is optimum for sensitization and hemagglutination. The stability and sensitivity of the test is increased with this regimen, and the time for the completion of the reaction is shortened from 2 1/2 to 1 1/2 hours.

"5. The optimum concentration of tannic acid for treatment of sheep erythrocytes is within a range of 0.02%-0.01%.

"6. Fluctuation of the pH value of the medium within limits of 6.4-7.0 had no particular effect on the sensitivity of the reaction upon sensitization of the erythrocytes treated with tannic acid; on increase of the pH to 7.2, the sensitivity of the reaction was cut in half."

94. Luminescent Sera for Detecting Botulism Pathogens

"The Problem of the Identification of Botulism Pathogens With the Aid of Luminescent Sera," by T. I. Bulatova and Ye. A. Kabanova, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 3, Mar 60, pp 18-21

Testing of a method of identifying Cl. botulinum rapidly in a mixed culture by the use of luminescent sera is discussed. Three series of sera were prepared from the globulin fraction of type B antibotulinum serum obtained by immunization of horses with anatoxin from Cl. botulinum toxin type B (strain No 175). These sera had high antitoxic properties (3,000 AE per ml) and agglutinated a homologous culture in a dilution of 1:1,600. Fluorescein isocyanate, series No 22 isomer II and series No 23 and No 24 isomer I, prepared at the Institute of Chemical Reagents, were used. Steps were taken to eliminate nonspecific luminescence.

The luminescent sera were tested with the following strains of aerobes and anaerobes: Cl. botulinum, types A, B, C, D, and E; Cl perfringens types A, B, C, D, and F; Cl. sporogenes; B. anthracoides; and B. coli commune. The methodology is discussed in detail. Special experiments were performed to explore the possibility of identifying spores at different stages of formation. ML-1 of MBI-1 microscopes (which provided a magnification of 450-500) were employed. A photomicrograph of Cl. botulinum type B treated with liminescent antibotulinum serum type B is given; a table shows that no precise relationship exists between the intensity of illumination of the microorganisms and the agglutination reaction with antibotulinum serum type B.

The data obtained in these experiments substantiate the fact that the reliability of the luminescent-serological method depends on the antigenic structure of the microorganisms examined. The method can still be used only for preliminary identification in microscopic preparations of botulism pathogens. Further study is required for improvement of the method.

Immunology and Therapy

95. Prophylaxis and Therapy of Experimental Plague

"The Dibenzylethylenediamine Salt of Chlortetracycline in the Prophylaxis and Therapy of Experimental Plague." by L. N. Makarovskaya, Ye. N. Aleshina, and Ye. N. Lazareva, Rostov-na-Donu State Scientific Research Antiplague Institute and Chair of Microbiology of Central Institute for Advanced Training of Physicians; Moscow, Antibiotiki, Vol 5, No 1, Jan/Feb 60, pp 70-73

Experimental plague was induced in mice by the subcutaneous injection of a virulent strain of Bacterium pestis 773. Dibenzylmethylenediamine was administered to the animals intramuscularly at various times during the preinfection and post infection periods in single doses of 3 milligrams, repeated in 48 hours. Observations made for a 30-day period established that the dibenzylmethylenediamine of chlortetracycline is an effective prophylactic in protecting the animals against experimental plague infection. It has a well expressed therapeutic effect in experimental plague infection and its high effective prophylactic and therapeutic properties provide a basis for prospects that it may be utilized in the future as a therapeutic and prophylactic agent against plague.

96. Chlortetracycline Therapy of Radiation Sickness

"Experimental Data on the Study of the Effect of Chlortetracycline When Administered per os in Different Types, of Complex Therapy of Acute Radiation Sickness," by N. V. Rayeva, N. I. Bicheykina, M. I. Fedotova, I.N. Usacheva; Moscow, Antibiotiki, Vol 5, No 1, Jan/Feb 60, pp 73-77

A report on the results of investigations which were conducted by Prof P. D. Gorizontov and Prof Z. V. Yermol'yeva (Corresponding Members of the Academy of Medical Sciences USSR) to determine the effectiveness of chlortetracycline when applied per os in the complex therapy of acute radiation sickness is presented. The experiments were carried out on 31 dogs, 17 experimental and 14 control. All the animals were subjected to radiation. Chlortetracycline was added to the complex therapy of the

animals from the first days of radiation and was administered in doses of 25 milligrams per kilogram of body weight four times in 24 hours for a period of 20-25 days. The experiments established the definite therapeutic effectiveness of the antibiotic when used in conjunction with the other means of therapy. More of the experimental animals survived than control animals; longevity was increased. Dimedrol and fractional blood transfusion are recommended in cases of side reactions.

97. Echinopsine in Therapy of Diseases of Nervous System

"Clinical Application of Echinopsine, an Alkaloid," by G. P. Gubina, All-Union Scientific Research Institute of Medicinal and Aromatic Plants; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 2, Feb 60, pp 53-54

Echinopsine is an alkaloid obtained from the seeds of the plant Echinops Ritro L by Ye. N. Zheleznova, A. I. Ban'kovskiy, and V. I. Frolova of the All-Union Scientific Research Institute of Medicinal and Aromatic Plants. It was pharmacologically tested on 200 patients suffering from diseases affecting the central and peripheral nervous systems: poliomyelitis, myopathia, myasthenia, paralysis of the facial nerve, paralysis of the trigeminal nerve, plexitis, radiculoneuritis, transverse myelitis, multiple sclerosis with manifestations of pyramidal and extrapyramidal insufficiency, and asthenia with manifestations of vascular dystonia and hypotonia. Echinopsine nitrate, $C_{10}H_9ONHNO_3$, was administered to patients subcutaneously, or internally in the form of drops. No side reactions were noted in any of the patients.

A noticeable improvement in the condition of the patients and in many cases a complete restoration of the lost functions was observed. Positive results were noted in some cases of multiple sclerosis, particularly in patients who have been ill for periods of 3-5 years and predominantly in younger patients. These are only preliminary observations which, however, merit serious attention. It was found to be effective also in the therapy of radiation sickness by removing asthenic and asthenodepressive syndromes. The results of the clinical tests established echinopsine as one of the more effective neuromuscular stimulants now being used. Its use is contraindicated in cases of stenocardia, myocardial infarct, and hypertonias of second and third stages.

98. Effect of Tetracycline When Used in Therapy of Gas Gangrene

"Effect of Tetracycline Hydrochloride on the Peripheral Blood Picture in Guinea Pigs in Experimental Gas Gangrene Induced by Bacillus perfringens," by Yu. D. Chirkin, Chair of Microbiology, Astrakhan Medical Institute; Moscow, Antibiotiki, Vol 5, No 1 Jan/Feb 60, pp 102-107

One hundred guinea pigs were used in experiments conducted to determine changes in the peripheral blood of animals in which gas gangrene was induced, and which were then treated with tetracycline hydrochloride. Gas gangrene was induced in the animals by the use of the standard highly virulent strain BP6K of Bacillus perfringens. Investigations of the blood of the animals that survived were conducted on the first, second, third, fifth, seventh, and tenth days after the infection.

The investigations established that: tetracycline hydrochloride administered in doses of 5 milligrams simultaneously with a lethal dose of the Bacillus perfringens prevented the death of the experimental animals; a slight decrease in the number of erythotrocytes, hemoglobin, and leukocytes was found in the peripheral blood of the animals; in control animals in the final stage, severe hypochromic anemia, leukopenia with a degenerative shift to the left, lymphopenia, and monocytosis were observed; the erythyocyte content of the experimental animals was restored to normal within 7 days; the leucocyte content, however, did not reach its normal state by the tenth day from the beginning of the experiment. Tetracycline hydrochloride administered to healthy animals in therapeutic doses produced slight leukopenia.

99. Prophylaxis and Therapy of Shock

"Some Results of the Investigation of the Pathogenesis, Prophylaxis, and Therapy of Different Types of Shock," by Prof I. R. Petrov, Corresponding Member of Academy of Medical Sciences USSR, Chair of Pathological Physiology, Military-Medical Order of Lenin Academy imeni S. M. Kirov, and Laboratory of Experimental Pathology, Leningrad Institute of Blood Transfusion; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 14, No 11, 1959, pp 13-24

The author traces the genesis of various types of shock, and recommends methods of prophylaxis and therapy. Shock may be caused by different types of traumas, burns, ionizing radiation, as well as changes in the functions of the endocrine glands. The degree and forms of shock are closely linked with the state and functions of nervous activity. Artificial thermotherapy is not recommended in the therapy of shock. The application of dibazole, glucose, and vitamins, as well as neuroplegic drugs, has been found beneficial in the prophylaxis and therapy of shock.

100. Therapy of Infectious Hepatitis

"Observations on the Results of the Application of Acidophil-Bacterial Mass in the Therapy of Gastric and Hepatic Diseases," by Ye. Vardjz; Tallinn, Zdravookhraneniye Sovetskoy Estonii, No 1, Jan/Feb 60, pp 62-64

An acidophil-bacterial mass was administered to ten patients suffering from infectious hepatitis (Botkin's disease). All the patients were given the bacterial mass 15 minutes before meals in doses of 2-3 grams in combination with 0.05 gram of nicotinic acid: in addition, they received vitamins C three times a day after meals. After 24-60 hours of treatment, nausea, vomiting, and gastric disturbances disappeared, and the general condition of the patients improved. The size of the liver was restored to normal in most of the patients after a few days of therapy. The acidophil-bacterial mass was found to be effective also in gastric disturbances.

101. Therapeutic Properties of Hyaluronidase-Isoniazid Solution

"The Effect of Hyaluronidase on the Physical properties of Aerosols," by T. Garbinski, S. Gasior, E. Pomianowska, and J. Zwolinski, Gruzlica, No 27, Vol 6, 1959, pp 477-482 (from Meditsinskiy Referativnyy Zhurnal, No 2, Section 2, Feb 60, Abstract No 300, by Yu B. Moytlis)

"Various methods, especially the method of reducing the size of aerosol particles, have been used to intensify the therapeutic effect of aerosols. The diameter of aerosol particles should not exceed one micron, because only particles of this size can penetrate the alveolar walls. Another method consists of adding hyaluronidase to aerosols. By this method the permeability of the intercellular substance is increased and this increases the concentration of the therapeutic substances, which are administered in the form of aerosols, in the tissues and blood. Tests have shown that by the addition of hyaluronidase to the isoniazid aerosol, the electrical charge of the aerosol particles is decrease 24% below the charge of the particles of pure isoniazid aerosol. This decrease is caused by the heterogenous nature of the isoniazid-hyaluronidase solution, but it [the decrease] is small and it does not restrict the positive effect of hyaluronidase which leads to a significant increase of the isoniazid concentration in the blood and tissues. For eliminating the unfavorable effect of hyaluronidase, the authors recommend that isoniazid be used in aerosol form, but that hyaluronidase be administered intramuscularly."

102. Bulgarians Conduct Second Polio Vaccinations

"Second Immunization Against Infantile Paralysis" (unsigned article); Sofia, Rabotnichesko Delo, 22 Mar 60, p 2

According to a brief article, the second immunization series against poliomyelitis, with an oral vaccine, will be conducted throughout Bulgaria on 22 and 23 March 1960. Children from 2 months through 14 years of age and students over 14 years of age, who were immunized for the first time in February will receive the oral vaccine.

Children who were omitted or rejected because of illness during the February immunization program can now be given the vaccine for the first time.

Oncology

103. Indoor Air Content of 3,4- Benzpyrene

"On the Presence of 3,4-Benzpyrene in the air of Living Quarters," by P. P. Dikun, Laboratory of Experimental Oncology of Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 6, No 2, Feb 60, pp 84-86

The flourescent-spectral method was used in tests which were conducted to determine the content of 3,4-benzpyrene, a cancerogenic agent, in the air of living quarters. Dust samples were gathered from the floors, rugs, upholstered furniture, clothes, and ventilation screens of three flats in Leningrad. The presence of 0.3-0.8 gamma of 3,4-benzpyrene per gram of dust, about one tenth of that in outdoor dust, was established.

109. Transplantation of Frozen Tumorous Tissue

"Experiment of Transplantation of Tumorous Animal Tissue Subjected to Deep Freezing," by N. S. Kiseleva, Laboratory of Tumor Strains, Division of Etiology and Pathogenesis of Tumors, Institute of Experimental and Clinical Oncology; Moscow-Leningrad, Voprosy Onkologii, Vol 6, No 2, Feb 60, pp 76-80

Experiments were carried out to determine the possibility of utilizing transplants of tumorous tissue which were subjected to freezing and thawing, and the effect of freezing on the take possibilities and latent growth of such transplants. It was established that transplants of tumorous tissue kept at a temperature of minus 30 degrees C for even brief

periods of time lose some of their take potentials; the latent period of the growth of the tumors is prolonged; and freezing the transplants at a temperature of minus 70 degrees C does not change the above indexes even when preserved at this temperature for prolonged periods of time.

Pharmacology and Toxicology

105. Central Cholinolytics

"Pharmacology of Central Cholinolytics," by P. P. Denisenko, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 15, No 2, Feb 60, pp 20-30

Investigations were conducted to determine the pharmacological properties of a group of so-called central cholinolytics, that is, preparations which affect predominantly the cholinoreactive structure of the central nervous system. On the basis of their chemical structures, most of these compounds are complex esters of aromatic acids and amino alcohols or their derivatives. The group includes such compounds as difacil, aprophen, diazil, methyldiazil, methyldiafacil, IEM-268, tiphen, diprophen, thioester 22, arpenal, pentaphen, tropacin, and diphazin, the structural formulas of which are given in the text. The investigations established that the preparations depress conditioned reflex activity, modify bioelectrical cerebral activity, prevent the development of nicotine and arecoline induced spasms, enhance the action of anesthetics and somnifacient drugs, and depress the bulbar centers.

The nature of their cholinolytic action indicates the presence of an expressed antagonism with cholinomimetic and anticholinoesterase drugs. A study of the intensity of the action revealed a definite relationship between their chemical structure and their action. Experimental and clinical data indicate that these substances may be effectively utilized in different areas of practical medicine, primarily in neuropathology and psychiatry. Diazil, tropacin, methyldiazil, pentaphen, difacil, and methyldifacil are now clinically applied in the therapy of alarm-depression states, to intensify the action of aminazine, to strengthen the result of electric shock therapy, and in other diseases.

106. Mechanism of Action of Ganglioblocking Substances

"On the Problem of the Mechanism of the Effect of Ganglioblocking Substances on Peripheral Viscero-Visceral Reflexes," by V. V. Zakusov and O. V. Ul'yanova, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Bulleten' Eksperimental'noy Biologii i Meditsiny, Vol 44, No 1, Jan 60, pp 75-78

Investigations were conducted to determine the effect of tetraethyl ammonium, pentamin, and hexonium, ganglioblocking substances, on reflexes which emanate from the urinary bladder and response reactions of the ileum, transverse colon, and jejunum, after all the preganglionic fibers of the inferior mesenteric ganglia were preliminarily severed. The experiments were carried out on cats. The section of the fibers of the mesenteric ganglia caused the degeneration of the fibers, precluding any possible execution of axon reflexes with the participation of preganglionic axons. The intravenous administration of tetraethyl ammonium, pentamin, and hexonium inhibited the reflexes from the urinary bladder and the response reactions of the ileum, transverse colon, and jejunum, an effect produced by these substances without the preliminary section of the preganglionic fibers, as well as with an intact central nervous system, indicating that the preganglioblocking fibers play no part in the depression of viscero-visceral reflexes from afferent to efferent and automatic ganglia.

107. Curarelike Action of Some Preparations

"Concerning the Curarelike Action of Derivatives of Cis-1,3-cyclobutanedicarboxylic Acid, and alpha-Truxyllic Acids," by L. A. Kravchuk, Laboratory of Special Pharmacology, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 1, Jan/Feb 60, pp 46-50

The pharmacological properties of dialkylaminoalkyl derivatives of cis-1,3-cyclobutanedicarboxylic and alpha-truxyllic acids are described. The compounds were synthesized at the Division of Organic Synthesis of the Institute of Pharmacology and Chemotherapy, and are identified as follows: compounds A-03 and A-06 which are, respectively, the dihydrochloride and diiodomethylate of the diester of cis-1,3-cyclobutanecarboxylic acid; compounds A-04 and A-07, respectively, the hydrochloride and iodomethylate of the ester amide of the same acid; compounds T-36, T-58, T-59, T-62, T-74, T-75, T-83, and T-91, diidomethylates of the diesters of alpha-truxyllic acid; and compounds T-35 and T-60, dihydrochlorides of the same acid.

A table in text provides the structural formulas of these compounds. As a result of the experiments which were carried out, it was established that of the 14 preparations mentioned, 12 possess more or less expressed curarelike properties. Compound T-74, which in doses of 100 - 200 micrograms per kilogram of body weight completely blocked neuromuscular transmission, was found to be the most active of the preparations. All the compounds were found to have a depressing effect on respiration. A comparative study of the preparations derived from cis-1,3-cyclobutanedicarboxylic acid and those obtained from alpha-truxyllic acid disclosed that the latter are more active than the former.

108. Toxicological Studies on New Chemical Substances Published

"Toxicity of New Chemical Substances," by S. N. Kremneva, N. K. Kulagina, and I. P. Ulanova, Institute of Labor Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 1, Jan 60, pp 60-61

Toxicity studies of new chemical substances were recently made at the Institute of Labor Hygiene and Occupational Diseases. The maximum permissible concentration of these compounds, given below, was recommended:

1. Dichlorohydrin - $CH_2ClCHOHCH_2Cl$. Continuous exposure to this substance in concentrations of 0.2-0.3 mg/liter causes severe changes in the internal organs, chiefly the respiratory system and the kidneys, and sometimes causes death. The maximum permissible concentration has been recommended at 0.005 mg/liter.

2. Nitrocyclohexane - $C_6H_{11}NO_2$. A highly toxic substance. The average lethal dosage administered orally to mice is 125 mg/kg; the absolute lethal dosage over a 2-hour exposure is 0.15 mg/liter. Continuous exposure to a concentration of nitrocyclohexane of several million parts per liter causes depression of the central nervous system and lowering of the blood pressure in rats. The maximum permissible limit of concentration of this compound is recommended at 0.0001 mg/liter.

3. Silicochloroform - $SiHCl_3$. The lethal concentration for a single 2-hour exposure is established at 4-5 mg/liter, 50% lethal concentration is 3 mg/liter, and the minimum lethal concentration is 0.8 mg/liter. The maximum permissible concentration is recommended at 0.002 mg/liter.

4. Aminoenanthic acid - $NH_2(CH_2)_6COOH$. The absolute lethal dosage of this compound administered internally in the stomach of white rats is 12.5 g/kg; the lethal dosage is 9 g/kg, and the minimum lethal dosage is 6 g/kg. The maximum permissible concentration is recommended at 10 mg/cu m, the standard for nontoxic dusts.

5. Thiodivaleric acid - $S[(CH_2)_4COOH]_2$. The absolute lethal dosage of this compound administered internally in the stomach of white rats is 5 g/kg, the lethal dosage is 3.5 g/kg, and the minimum lethal dosage is 1.5 g/kg. The maximum permissible concentration is recommended at 5 mg/cu m.

109. Clinical Application of Tetramine

"Application of Tetramine, a Ganglioblocking Substance, in a Neurological Clinic," by F. M. Lisitsa, Republica Clinical Hospital imeni P. Stradynya, Riga; Moscow, Zhurnal Nevropatologii i Psikhatrii imeni S.S. Korsakov, Vol 40, No 2, Feb 60, pp 162-166

Tetramine, teramethylene-1, 4-bis- (N-methylpyperidine) diiodide, is a ganglioblocking substance synthesized at the Institute of Organic Synthesis of the Academy of Sciences Latvian SSR by Kh. M. Wasserman. It was applied to 64 patients suffering from different forms of neuroses. Positive results were obtained in all cases. Therapy should begin with small doses: 40 milligrams once a day, and then two or three times a day. Side reactions have been found to be slight. A rise in skin temperature was noted in patients sensitive to the drug. It reduced blood pressure.

110. Toxicology of Insecticide Tinox (Cebetox)

"On the Toxicology of the Systemic Insecticide Tinox," by T. Hiepe and E. Seidel, Institute of Veterinary Pharmacology and Toxicology and Medical Veterinary Clinic, Karl Marx University, Leipzig; Leipzig, Monatshefte fuer Veterinaermedizin, No 4, 15 Feb 60, pp 123-126

A toxicological study was made of the systemic insecticide Tinox (formerly marketed as Cebetox), manufactured by VEB (People-Owned Enterprise) Farbenfabrik, Wolfen (Kreis Bitterfeld). Tinox is a compound from the trialkylthiophosphate group and is used to protect plants from sucking parasites; it is a yellow-brown, highly concentrated emulsion spray with a penetrating garlic odor and strongly irritating to the eyes. It has a specific weight of 1.1395. Toxicological investigations

on rats, rabbits, and pigs following external and internal application of Tinox showed that the LD_{50} for rats (oral) is 84 milligrams per kilogram of body weight, but that oral administration of one-percent aqueous Tinox emulsion (80-800 milligrams per kilogram of body weight) in pigs produces no clinically manifested symptoms of poisoning. On the other hand, the strong toxicity on the skin is very noticeable. The cholinesterase values show a considerable range of physiological variations, and a distinctly recognizable inhibition was produced following the use of the insecticide. An increase of blood sugar concentration in pigs was also noticed following administration of Tinox. The clinical and laboratory-diagnostic studies were supplemented by pathological-anatomical findings.

111. Toxicity of Chloracetyl Chloride

"Experimental Investigation of the Toxicity of Chloracetyl Chloride," by S. Herzog, Igiyena (Rumania), 1959, 8, No 2, 135-144 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 60, Abstract No 1334, by the author)

"The action of lethal and toxic concentrations of chloracetyl chloride ($ClCH_2COCl$) in mice, rats, and guinea pigs was studied. The author established that this substance irritates the upper and deep respiratory organs, having an action similar to that of chlorine. The maximal allowable concentration of chloracetyl chloride in the air of industrial premises must not exceed 0.01 milligram per liter."

112. Problem of Hemopoiesis in Occupational Intoxications

"Concerning the Question of the Study of the Problem of Hemopoiesis in Occupational Intoxications," by V.V. Sokolov, Institute of Labor Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 3, No 6, Nov/Dec 59, pp 29-33

This article points to the rise in the morbidity of leukoses, aplastic and hypoplastic conditions, the hemorrhagic syndrome, changes in hemopoiesis caused by the action of such toxic substances as benzene, lead, styrene, trinotrotoluol, and such physical factors as radiation sickness. While widely applied sanitary-hygienic measures have done away with a good many of the harmful factors in occupational intoxications, the problem of concealed forms of such intoxications is a difficult one. In many cases, workers who are apparently in good health develop leukopenia, thrombocytopenia, and anemia which resist therapeutic interference. These cases are difficult to diagnose, and a specific and sensitive test for their identification must be developed. One of these

methods is the frequent study of the changes which take place in the nucleic acids and leukocytes of the peripheral blood. With the help of the luminescent method, the authors can observe changes in the blood cells caused by indicator doses of iodine-131 and sodium-24.

113. Effect of Intoxications on Work Capacity

"Effect of Small Concentrations of Poisonous Substances on Work Capacity," by Yu. I. Vasilenko, Kiev Institute of Labor Hygiene and Occupational Diseases; Kiev, Vrachebnoye Delo, No 2, 1960, pp 173-160

Three series of experiments were carried out on mice to determine the effect of small concentrations of toxic substances on the work capacity of the animals. In the first series of the investigations, the mice were subjected to work stress under normal living conditions. This experiment created a definite control basis for the determination of work capacity under normal conditions. In the second series of experiments, the animals were subjected to the action of small doses of a toxic substance for one hour daily, and the effect of the poison on their work capacity was studied. In the third series of experiments, the mice were subjected to the action of small doses of M-81, an organophosphorus compound of the insecticide group, for one hour daily for a period of 40 days. The investigations established that under the effect of small concentrations of chemical toxic substances, the work capacity of the animals diminished, with fatigue setting in at an early period. Work capacity was somewhat increased by providing longer than normal rest periods. However, at no time did the work capacity return to its initial value.

114. Al'bofungin, Antifungal Antibiotic

"Biological Characteristics and Method of Determining the Activity of Al'bofungin, a New Antifungal Antibiotic," by A. Ye. Tebyakina and C. M. Chaykovskaya, All-Union Scientific Research Institute of Antibiotics; Moscow, Antibiotiki, Vol 5, No 1, Jan/Feb 60, pp 26-28

Because of the prevalence of fungus diseases in the country, the need for an antibiotic with a wide spectrum of action in relation to pathogenic fungi and yeasts has grown considerably. Only a few of the antibiotics now known are applicable against fungi diseases. The new antibiotic al'bofungin, developed at the All-Union Scientific Research Institute of Antibiotics, has been found to be a strong fungistatic and antifungal preparation; it is also active against gram-positive bacteria.

Investigations of its properties disclosed that in concentrations of 0.02-1.0 gamma per milliliter it has fungistatic action on different strains of Candida and Yeasts, and in Concentrations of 0.3-5.0 gamma per milliliter it is effective against pathogenic fungi; in higher concentrations it acts as a fungicidal preparation; it is active against gram-positive bacteria in concentrations of 0.005-1.0 gamma per milliliter. The biological activity of al'bofungin can be determined by the method of diffusion, using Candida parapselosis as a test culture.

115. Fluorin, New Antibiotic

"Concerning the New Antibiotic From the Group of Actinomyces fluorescens," by S. I. Denisova, L. P. Kucheryavenko, and G. P. Men'shikov; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol 30, No 1, Jan 60, pp 332-334

Fluorin is a new antibiotic isolated from the mycelium of the actinomycete strain No 2703 which belongs to the group of Actinomyces fluorescens. It is a crystalline, optically inactive substance with a melting point of 142-143 degrees. Its chemical formula is $C_{36}H_{54}O_{12}$. Because of the molecular weight of the substance the accuracy of this formula could not be established by an elementary analysis. The formula, however, was confirmed by the hydrolytic decomposition of the substance. Fluorin has been found to be active against the tubercular bacillus in vitro, according to a study made at the All-Union Scientific Research Chemicopharmaceutical Institute. The methods of isolating and purifying the new antibiotic are described.

116. Proteus Sensitivity to Antibiotics

"Sensitivity of Proteus to Some Antibiotics and Nitrofuran Preparations, by A. B. Chernomordik, A. D. Kovalenko, T. V. Smirnova, V. G. Ponomareva, O. Kh. Malyar, and V. M. Vinogradova, Dnepropetrovsk Scientific Research Institute of Epidemiology, Microbiology, and Hygiene imeni N. F. Gamaleya; Moscow, Antibiotiki, Vol 5, No 1, Jan/Feb 60, pp 81-83

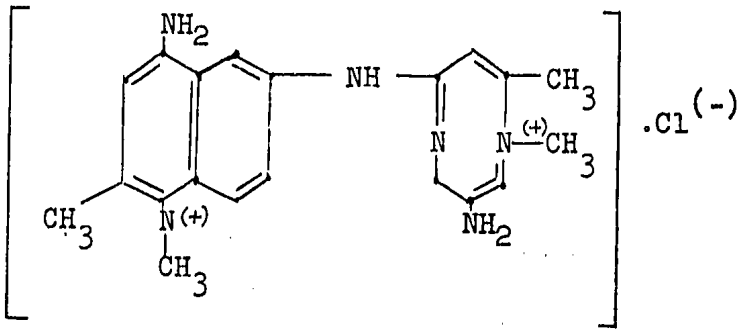
The sensitivity of 150 strains of Proteus, isolated from 150 patients at Dnepropetrovsk, to the antibiotics penicillin, syntomycin, streptomycin, tetracycline, chlortetracycline, colimycin, oxytetracycline, polymyxin, sanazin, erythromycin, ekmolin, and imanin, and the nitrofuran compounds furacilin, furadonine, and furazolidone was studied. About three fourths of the strains obtained were Proteus mirabilis; the rest were identified as Proteus vulgaris. The results of the investigations established that colimycin of the antibiotics, and the three nitrofuran preparations were

highly antimicrobic against all the strains of Proteus which were tested; tetracycline, streptomycin, and syntomycin displayed antimicrobic properties in relation to individual strains of Proteus, but only in concentrations which made possible the local application of these antibiotics: polymyxin, imanin, ekmolin, sanazin, and erythromycin were found to be almost inactive against the Proteus strains which were investigated.

117. Pyraldine, New Antitrypanosoma Preparation

"Chemotherapeutic Properties of Pyraldine," by G. N. Pershin and N. Yu. Moskalenko, All-Union Scientific Research Chemico-pharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 2, Feb 60, pp 52-53

Pyraldine, 1,1 -dimethochloride-4-amino-6-(2^1-amino-6^1- methyl pyrimidyl-4^1-amino)-quinaldine is a new antitrypanosoma preparation synthesized in the USSR. Its structural formula is as follows:



Experimental investigations established that pyraldine is effective against Trypanosoma equiperdum. Best results were obtained when the preparation was administered subcutaneously to white mice in a dose of 0.25 milligram per kilogram of body weight. A single dose of 0.5 - 1.0 milligrams per kilogram of body weight prevented the development of trypanosoma in the animals. Pyraldine is now widely used in veterinary practice, and played a considerable role in the solution of the problem of eliminating the trypanosoma in farm stock.

118. Conservation of Aqueous Extracts by Ultrasound

"Effect of Ultrasound on Liquid Aqueous Extracts," by L. S. Kazarnovskiy and L. A. Shinyavskiy, Khar'kov Pharmaceutical Institute; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 3, Mar 60, pp 38-41

A new method of conserving liquid aqueous extract preparations by subjecting them to the effects of ultrasound has been devised. The method was tried on aqueous extracts of the dog-rose [Rosa canina], beladonna, digitalis, and senna. The tests established that an aqueous extract of hip-rose subjected to the effect of ultrasound at a frequency of 480-490 kilocycles for a period of 10-11 minutes could be kept for 6 months, while the control extract became covered with a mold 2 or 3 days after its preparation; the liquid extract of belladonna subjected to a similar treatment could be kept for 3 1/2 months, while the control preparation could be kept for only 3 or 4 days. Similar results were obtained in the cases of the liquid aqueous extracts of digitalis and senna. It was established also that ultrasound does not affect the active principles of the drugs.

119. Fatigue and Nervous Activity

"Concerning the Connection Between Fatigue and the Type of Nervous Activity (On the Basis of Data of Ergographic Investigations)," by D. Mateyev and V. Georgiyev, Higher Institute of Physical Culture imeni Georgi Dimitrov, Sofia; Moscow-Leningrad, Fiziologicheskiy Zhurnal imeni I. M. Sechenov, Vol 46, No 2, Feb 60, pp 141-147

A Moss ergograph was used in experiments conducted to determine the connection between fatigue and the type of nervous activity. The experiments were carried out on 30 male students of the Institute of Physical Culture. The ergogram presents a graphic representation of the manner in which the transition of the stimulation process goes over into a process of inhibition during physical activities. It was established that the character of the transition is individually specific and is conditioned by the type of individual nervous activity. A convex ergogram is characteristic of persons with a strong type of nervous activity; a concave ergogram is characteristic of individuals with an inhibitory nervous activity. The ergographic method may be utilized also for typological investigations.

120. Conditioned Reflexes to Sound and Light

"Some Characteristics of the Development of Conditioned Reflexes to Acoustic and Photic Stimuli in Dogs," by N. S. Popova, Laboratory of Conditioned Reflexes Institute of the Brain Academy of Medical Sciences USSR; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 1, Jan/Feb 60, pp 80-87

The author of this article discusses one of several sets of experiments performed on three dogs to determine the differences in the development of conditioned motor reflexes to weak acoustic and strong photic stimuli. The movements of the dogs were unhampered.

It was observed that stabilization of conditioned reflexes to acoustic stimuli is accompanied by rapid stabilization of their latencies; the conditioned reactions to photic stimuli, under the same conditions have no constant latencies for a long time.

The development of differentiations to acoustic stimuli passes through a period of alternating correct and incorrect responses. These responses often have latencies characteristic to the conditioned reaction to a

positive tone. When differentiation to photic stimuli is developed, either no conditioned reaction is observed or it occurs with a latency longer than to the positive stimulus.

The differences in developing conditioned reflexes to photic and acoustic signals cannot be fully explained from the standpoint of the "law of strength."

121. Effect of Conditioning on Blood Temperature

"The Effect of the Development of Conditioned Reflexes on the Change in the Temperature of Blood Flowing to and Away From the Central Nervous System," by Genrikh Mourek, Chair of Physiology, Prague University; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 1, Jan/Feb 60, pp 96-100

This article describes the results of experiments conducted on five dogs to determine what influence food and conditioning have on the change in the temperature of blood flowing to and away from the central nervous system (art. carotis communis - sinus sagittalis).

A change in the blood temperature in the carotid artery and the sinus sagittalis was observed in dogs when they were subjected to either an unconditioned or a conditioned irritation. It was noted that positive irritations produced a rise in temperature in both the carotid artery and the sinus sagittalis; negative irritations, under conditions of stable differentiation, did not produce any changes in temperature.

Changes in blood temperature in response to irritation were not observed after conditioned reflexes became extinct. Other conditions being equal, changes in blood temperature were observed to be greater and of longer duration in the sinus sagittalis than in the carotid artery.

122. Epileptic Seizures Affect Conditioned Reflexes

"The Effect of Epileptic Seizures Caused by Acoustic Stimulation on Complex Conditioned Reflexes in Rats," by Wang Pin Chair of Physiology of Higher Nervous Activity, Moscow State University; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 1, Jan/Feb 60, pp 144-152

The author describes experiments conducted on 11 white male rats in which preliminary conditioned reflexes were developed by the food-procuring method with double levers.

A strong acoustic stimulus (the sound of a bell) did not affect conditioned reflex activity in "insensitive" rats. It caused considerable changes in conditioned reflexes of "sensitive" rats. Epileptic seizures caused by a strong acoustic stimulus produced functional disturbances in the area of the acoustic analysor which persisted for a period of 21-37 days.

123. Acclimatization to Extreme Cold

"Shifts in the Area of Physical Thermoregulation in Man During Acclimatization in the Extreme North," by Prof I. S. Kandor, Physiological Laboratory of Institute of General Communal Hygiene imeni A. N. Sysin, Academy of Medical Sciences USSR; Moscow, Gigiyena i Sanitariya, No 3, Mar 60, pp 6-12

The author of this article discusses experiments conducted to determine what physical thermoregulation changes take place in humans, during their acclimatization to the cold temperatures of far northern regions; vascular reactions that take place during cooling of the forehead, hands, and feet were examined. The phsyical thermoregulation changes noted during these experiments may partially expalin a decrease in the general morbidity rate, particularly a decrease in the incidence of colds as a result of acclimatization of the population to conditions peculiar to far northern regions. These changes must be taken into consideration when undertaking to organize rational forms of conditioning and training of the human body for work in cold areas, when attempting to develop measures of personal hygiene and prophylaxis, and when selecting proper protective clothing.

124. Effects of Combined Acoustic Stimuli

"Skin Galvanic Reactions Upon Combination of Two Acoustic Stimuli," by L. G. Voronin and Ye. N. Sokolov, Moscow State University imeni M. V. Lomonosov; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 1, Jan/Feb 60, pp 3-9

The authors of this article conducted 22 experiments on 16 healthy subjects with normal hearing to determine the mechanism whereby a temporary connection between two indifferent acoustic stimuli is formed. The study of the orienting reflex was conducted with the aid of the EPP-09 acoustic electronic potentrimeter (Sokolov, 1956), which records the skin galvanic reaction.

Results of the experiments showed that one acoustic stimulus, used at first, extinguished the orienting reaction. This acoustic stimulus was then combined with a second, indifferent acoustic stimulus which at first caused disinhibition of the orienting reflex and then led to the development of a conditioned orienting reaction. The subsequent application of the two acoustic stimuli led to the extinction of the orienting reaction. Disturbance of the entire complex produced an orienting reflex.

Public Health, Hygiene, and Sanitation

125. Improvement of Sanitation

"To Improve the Work of Sanitation Organizations" (unsigned article); Moscow, Gigiyena i Sanitariya, No 3, Mar 60, pp 3-5

This article says that greatly improved living conditions in the USSR, the use of preventive medical measures, an expanded physical education program, progress in medical science, and free qualified medical service to the population have brought about a decrease in the general and child mortality rate. The average life expectancy has doubled during the Soviets regime. In the author's opinion, the people of the sanitary epidemic control service deserve a fair measure of the credit for this achievement. Defects in sanitary conditions still exist, however. To correct these defects the Central Committee CPSU and the Council of Ministers USSR have issued a decree outlining an ambitious program for improving the entire sanitation program in the USSR.

The Central Committee CPSU and the Council of Ministers USSR directed the councils of ministers of the union republics, the sovnarkhozes, and local soviets to cooperate with scientific research and planning institutes and with trade-union organizations to eradicate and prevent pollution of reservoirs, soil, and air in cities and industrial centers and to improve the water supply, sewage disposal, and working conditions. Strict observance of hygienic and sanitary regulations by industrial and food processing establishments was also ordered.

This decree also ordered that measures be taken to strengthen the sanitary inspection organizations. This puts an end to any idea that the need for state sanitary inspection has disappeared.

The decree noted that many physicians have been assigned to sanitation work in various industries with which they were not familiar. The Central Committee CPSU and the Council of Ministers USSR ordered, therefore, that the Ministry of Health USSR draw up a broad program of instruction for physicians in new techniques and methods of operating various branches of the national economy. It must be remembered, however, that a sanitation physician must be a physician first and a specialist in hygiene and sanitation second.

The decree of the Central Committee CPSU and the Council of Ministers USSR also stated that sanitation physicians should not be required to supervise cleanliness which does not require special medical knowledge. Such work is to be turned over to the police, housing administrations, and the voluntary sanitary "aktiv." This "aktiv" consists of party, government, trade-union, and komsomol organizations, as well as the Red Cross.

Facilities of sanitary-epidemiological sections of rayon hospitals and sanitary-epidemiological stations must be expanded and their personnel increased. This is necessary if such infections as diptheria, tularemia, poliomyelitis, malaria, trachoma, and others are to be eradicated and the incidence of some other diseases is to be reduced.

Radiology

126. Case of Successful Treatment of Myasthenia Gravis by Roentgenotherapy

"Remote Results of Treating Myasthenia Gravis by X Irradiation of the Thymus and the Surgical Treatment of a Radiation Ulcer Resulting From It," by M. A. Merkova, N. P. Mordvinova, and E. B. Golland, Radiological Department of Scientific Research Roentgenoradiological Institute, Ministry of Health RSFSR, Central Institute for Advanced Training of Physicians, and Institute of Neurology, Academy of Medical Sciences USSR; Moscow, Vestnik Rentgenologii i Radiologii, No 1, Jan/Feb 60, pp 45-47

A case of the successful treatment of myasthenia gravis by X Irradiation of the thymus gland (total dose of 6,400 r) is described. The patient was observed for a period of 10 years without any symptoms of recurrence; however, 8 years after the successful treatment of the sickness, a radiation ulcer appeared in the sternal area of the skin and was successfully treated by surgical excision with subsequent plastic surgery.

This case, according to the author, is of interest not only in view of the favorable remote results of roentgenotherapy of myasthenia gravis, but also in view of the successful surgical intervention in the radiation injury of the skin.

127. Chemical Prophylaxis of Radiation Sickness

"Concerning the Utilization of Certain Chemical Substances in the Prophylaxis of Radiation Sickness. 1. Investigation of the Effect of N-phenylamidine Thiophen-2-Carboxylic Acid on the Resistance of Mice Irradiated With Lethal Doses Co^{60} Gamma-Rays," by St. Robev, Sovrem. Meditsina (Bulgaria), 1958, 9 No 11-12, 36-42 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 60, Abstract No 1319, by G. Vigdorovich)

"N-phenlyamidine thiophen-2-carboxylic acid (melting point 144-145 degrees from ligroin or aqueous-alcoholic solution) is prepared by regrouping the amide of the phenylhydrazone of the thienyl aldehyde. A dose of

1.5 milligrams (the $< LD_{50}$) contributed to the survival of 35 percent of the mice irradiated with 750 roentgen gamma rays (3 percent of the control); N-phenyl-2-furamidine contributed to the survival of 25 percent of the irradiated animals. N-phenylbenzamidine was found to be too toxic for application."

128. Blood Beta-Activity Significant in Differential Diagnosis of Cancer From Ulcers, Polyposis, and Chronic Gastritis

"Beta Radiation in the Blood of Persons Suffering From Malignant Neoplasms and Certain Other Diseases," by A. I. Danilenko and I. N. Shevchenko, Institute of Physiology imeni A. A. Bogomolets, Academy of Sciences Ukrainian SSR, Laboratory of Biophysics; Kiev, Fiziologichniy Zhurnal, Vol 5, No 1, Jan/Feb 60 pp 114-117

Research was conducted on the activity of beta radiation in the blood of 147 persons (45 healthy donors, 40 patients suffering from cancer of various sites, 30 patients with ulcers, polyposis, and chronic gastritis, and 32 patients with chronic leukosis, and polycythemia).

Beta radiation activity was determined in curie units per 100 grams of blood ash and ranged within the following limits:

Healthy subjects (donors): 1.2×10^{-10} to 1.7×10^{-10}

Cancer patients: 0.9×10^{-10} to 1.6×10^{-10}

Patients with ulcers, polyposis, and chronic gastritis: 1.8×10^{-10} to 2.2×10^{-10}

Patients with chronic and acute leukosis: 0.7×10^{-10} to 1.4×10^{-10}

Patients with polycythemia: 2.10^{-10} to 2.4×10^{-10}

The difference in the range of beta-activity in the blood of cancer patients and in the blood of patients suffering from ulcers, polyposis, and chronic gastritis can be significant in differential diagnosis.

129. Method for Determining Total Alpha- and Beta-Radioactivity of Radon Decay Products in Air

"Experience Gained in the Study of the Natural Radioactivity of the Air," by I. I. Gusarov, Chair of General Hygiene of First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiyena i Sanitariya, No 2, Feb 60, pp 86-88

Natural radioactivity of the air was determined on the basis of the air radon content plus the content of radon decay products: RaA, RaB, RaC, and RaC'.

Results of these studies may be summarized by the following conclusions:

1. The natural radioactivity of the atmosphere constantly fluctuates (according to the author's data from 1 X 10^{-13} to 6 X 10^{-13} curies/liter of air).

2. The natural radioactivity of the air inside buildings is higher than the radioactivity of the outside air: in the laboratories, by 4-6 times and in basement rooms, by 8-25 times.

3. The method used in this research is unique in its simplicity and practicality, but makes it possible to determine only approximate values of the total alpha- and beta-activity of radon decay products in the air.

130. Electron Microscopic Study of Loose Connective Tissue Structure During Acute Radiation Sickness

"Electron Microscopic Study of the Fibrous Structure of Loose Connective Tissue During Acute Radiation Sickness," by V. V. Shikhodyrov; Kiev, Fiziologichniy Zhurnal, Vol 5, No 1, Jan/Feb 60, pp 118-124

The purpose of the present research was an electron microscopic study of changes occurring in the fibrous elements of loose connective tissue during acute radiation sickness.

The research was conducted on rats suffering from acute radiation sickness caused by whole-body X irradition by 600-1,200 r doses. The animals were sacrificed by decapitation at various periods after acute radiation sickness.

Results of data obtained reveal the following:

1. Changes of a destructive nature appear in the fibrous elements and in the intercellular substance of loose connective tissue following X irradiation of rats by 600-1,200 r doses.

2. During the first few hours after irradiation, mucoid edema develops and a large quantity of granules from decomposed mast cells appears.

3. During the peak of radiation sickness there is resorption of the edematous fluid a decrease in the quantity of the intercellular substance, and some swelling and adhesions of the collagenous fibrils, all of which give the connective tissue structure the appearance of a "sieve,"

4. The changes in the fibrous elements and intercellular substance which appear in acute radiation sickness reveal to a certain extent the cause of the disturbance in tissue permeability.

131. Tissue Respiration and Glycolysis During Development of Radiation Sickness

"Tissue Respiration and Glycolysis During the Development of Acute Radiation Sickness," by D. A. Golubentsev and G. V. Sazykin; Moscow, Voprosy Meditsinskiy Khimii, Vol 6, No 1, Jan/Feb 60, pp 49-52

The intensity of tissue respiration and glycolysis of rat and rabbit organs was investigated during the first few minutes and the first hour after whole-body exposure to hyperlethal (25,000 r) and lethal (800-1,000 r) doses of X rays and gamma rays, and also during the peak of acute radiation sickness.

Results of these experiments show the following.

1. Whole-body irradiation of animals by doess up to 25,000 r did not inhibit tissue respiration or glycolysis during the first minutes and hours after irradiation.

2. During the peak of acute radiation sickness of the third degree, the degree of respiratory activity was sharply inhibited in the bone marrow tissue: it was significantly decreased in the spleen and the intestinal mucous membrane, and it was slightly decreased in the liver; but it was essentially unchanged in the remaining organs: the cerebral cortex, kidney, myocardium, lungs, and diaphragm.

3. During the peak of radiation sickness of the third degree, the anaerobic glycolytic activity was significantly decreased in the spleen and skeletal muscles.

4. The intensity of respiration in the spleen, intestinal mucous membrane, and bone marrow is restored to normal during the period of clinical recovery.

132. X-Irradiation Effects on Glycogen Metabolism

"X-Ray Effects on Brain and Tissue Glycogen Fractions," by F. D. Koldobskaya, T. M. Mironova, and A. A. Dudkovskaya, Materialy Nauchn. Sessii Posvyashch. 40-Letiyu BSSR (Data of the Scientific Session Commemorating the 40th Anniversary of the Belorussian SSR); Minsk, 1959, pp 136-138 (from Referativnyy Zhurnal--Khimiya, Biogicheskaya Khimiya, No 4, 25 Feb 60, Abstract No 5164, by M. Piotrovskiy)

"Under the effect of a single whole-body X-irradiation, the content of total glycogen and its various fractions in the brain tissue of rats is changed. From the 15th to the 60th day after irradiation, the protein-bound glycogen content in the brain tissue is increased, and from the 20th to the 45th day the free glycogen content in the brain tissue is increased. During this same period (20th-60th day), the total glycogen content is significantly increased. This indicates that at definite periods after irradiation, brain tissue loses its capacity to utilize glycogen. During the first 3 weeks after irradiation, there is some decrease in the muscle glycogen content, and up to the 15th day there is some decrease in the liver glycogen content. Toward the 20th-30th day, normalization takes place and there is even some increase in the glycogen content of muscles and liver; this, however, changes by the 45th-60th day to a decrease."

133. Use of Preliminary Ultraviolet Irradiation to Decrease Severity of Gamma-Irradiation Sequelae

"The Use of Ultraviolet Irradiation of Various Spectral Compositions for Decreasing the Sequelae of Radiation Injury," by T. A. Sviderskaya, Ye. G. Zhuk, and I. N. Filipson, Institute of Radiation Hygiene, Ministry of Health RSFSR; Moscow, Gigiyena i Sanitariya, No 2, Feb 60, pp 27-34

The purpose of this research was to investigate the possibility of using ultraviolet irradiation as a prophylactic measure against penetrating radiation injuries.

Tests were conducted on 202 guinea pigs, one group of which was subjected to gamma irradiation by 450 r, while the other group was subjected to various doses of ultraviolet irradiation 9-14 days prior to gamma irradiation.

The authors present the following conclusions.

1. Tests on guinea pigs prove that the prophylactic use of ultraviolet irradiation increases the resistance of organisms to the effects of lethal doses of gamma irradiation.

2. The advantages of subjecting animals to prophylactic irradiation by ultraviolet rays are evidenced by an increased survival rate and life span, a smaller drop in the number of erythrocytes and the quantity of hemoglobin and cholinesterase, greater physical strain endurance, and more rapid and extensive reparatory processes.

3. Essential factors forming the basis for the prophylactic effect of ultraviolet irradiation are the spectral composition (a 280-380-millimicron wave length with an erythematous effect, and a 253.7-millimicron wave length with a bactericidal effect), and the magnitude of the total dose of ultraviolet irradiation; the time interval between the effect of both agents on the organism; and the method of ultraviolet irradiation. By increasing the total dose of erythematous irradiation from 7.5 to 15, the prophylactic effect of ultraviolet irradiation is increased; an increase in the total dose of irradiation from a PRK-2 lamp (from 3.75 to 15) and from the bactericidal lamp (from 7.5 to 15) decreases the prophylactic effect.

134. Purification of Radioactive-Iodine-Contaminated Sewage

"Methods for Purifying the Radioactive Iodine-Contaminated Sewage of Therapeutic Institutions," by T. A. Berezina and V. Ya. Golikov, Chair of General Hygiene of First Moscow Order of Lenin Medical Institute imeni I. M. Sechenova; Moscow, Gigiyena i Sanitariya, No 2, Feb 60, pp 12-14

The constant and extensive use of radioactive iodine creates great hazards in the environments of therapeutic institutions. To decrease the activity of radioactive iodine, which is eliminated through the urine, by a factor of 1,000, huge amounts of water must be used to dilute it, and the urine must be treated for about 3 months. This procedure is too expensive, hazardous, and cumbersome and not efficient enough.

The authors propose a method based on the specific sorption of iodine in its atomic form. The method consists of adding stable iodine in the form of KI, calculated at 5 mg/liter of sewage; then after the addition of chlorine gas or chlorinated water, the sewage is passed through an EDE-10 synthetic filter where the iodine sorption takes place. This process removes up to 97% of the radioactive iodine. For further decreasing the radioactivity, the entire process may be repeated.

The effectiveness of the method may be improved by discovering a more effective sorbent.

135. Therapy of Peritoneal Adhesions

"Prophylaxis and Therapy of Peritoneal Adhesions by the Homotransplantation of Conserved Peritoneal Tissue," by A. S. Kalugin, Hospital of Surgical Clinic of Vitebsk Medical Institute; Minsk, Zdravookhraneniye Belorussii, Vol 5, No 1, Jan 60, pp 15-17

Forty dogs were used in experiments conducted to determine the possibility and effectiveness of the homotransplantation of peritoneal tissue conserved in a blood stabilizer at temperatures of 4-8 degrees above zero, when used in the prophylaxis and therapy of peritoneal adhesions. Adhesions did not develop in any experimental cases, while other types of transplants failed to prevent the development of adhesions. Homotransplantations of conserved peritoneal tissue was carried out on 25 patients in closing defects of the serous membrane. Observations of the patients in the postoperative period, carried out for periods of 6 months to 2 1/2 years, confirmed the value of this method of prophylaxis and therapy of adhesions.

Veterinary Medicine

136. Spontaneous Infection of Rabbits With Virus of Equine Encephalomyelitis

"Spontaneous Infection With the Virus of Borna Disease in the Case of Rabbits," by J. Otta and K. D. Jentzsch, Thuringian Office of Veterinary Research and Animal Health, Jena; Leipzig, Monatshefte fuer Veterinaermedizin, No 4, 15 Feb 60, pp 127-129

A report is given of the first case of spontaneous infection of a rabbit with the virus of equine encephalomyelitis. The diagnosis was confirmed by the clinical picture, the transmission of infection to other rabbits, the pathological-histological findings, and the identification of complement-fixing antibodies in the serum of experimental animals.

Parallel investigations conducted by Dr Mueller at the Research Institute for Vaccines at Dessau concurred in the Jena findings.

VIII. METALLURGY

Ore Dressing

137. Process for Dressing Poor Copper-Cobalt Ore From Krasnoyarsk Region

"Dressing Poor Copper-Cobalt Ore With the Application of Hydrometallurgical Processes," by A. V. Astaf'yeva, M. D. Ivanovskiy, and S. K. Shabarin, Chair of Metallurgy of Noble Metals, Krasnoyarsk Institute of Nonferrous Metals; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, No 1, 1960, pp 48-56

A method is described for processing cobalt ore from one of the deposits of the Krasnoyarsk region which contains 0.086% Co, 0.23% Ni, and 0.88% Cu. A cobalt concentrate containing 1.17% Co is obtained by three flotation and two grinding stages. Hydrometallurgical processing of the concentrates results in a cobalt product containing 12.2% Co and a copper product containing 36.1% Cu; extraction of cobalt and copper are equal to 61.0% and 78.4%, respectively, of their content in the initial ore.

Physical Metallurgy

138. New Cu-Be-Mn Alloys Developed From Phase Studies

"Investigation of the Phase Diagram of the Ternary System Cu-Be-Mn," by M. V. Mal-tsev and Chou Shi-ch'ang, Chair of Physical Metallurgy, Krasnoyarsk Institute of Nonferrous Metals; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, No 1, 1960, pp 138-144

Isothermal sections of a phase diagram for temperatures of 800, 700, 600, 500, and 350°C and a number of polythermal sections were constructed on the basis of results from investigations of alloys of the ternary system Cu-Be-Mn containing up to 12% Mn and up to 5% Be. Three nonvariant transformations in the system were established: the eutectic, $L \rightleftarrows \alpha + MnBe_2$ (for the quasibinary section Cu-$MnBe_2$) occurring at 782°C; the peritectic, $\alpha + L \rightleftarrows \beta + MnBe_2$ at 768°C; the peritectoid, $\beta + MnBe_2 \rightleftarrows \alpha + \gamma$ at 620°C; and one monovariant transformation, $\beta \longrightarrow \alpha + \gamma$. The above investigations resulted in the disclosure of three new alloys with the following compositions: 1.2-1.3% Be, 3.7-5.5% Mn, remainder Cu; 0.9-1% Be, 7-8% Mn, remainder Cu; and 0.6-0.7% Be, 12-13% Mn, remainder Cu. It is claimed that

these three alloys have high strength, good resistance to oxidation and corrosion failure and that they may be recommended as new constructional materials in various fields of engineering.

139. Effect of s-Phase Content on Properties of Al-Mn Alloys at Room and Elevated Temperatures

"Effect of Copper and Magnesium on the Properties of Aluminum-Manganese Alloys at Room and Elevated Temperatures," by M. V. Zakharov, Z. A. Sviderskaya, E. S. Kadaner, and N. I. Turkina, Institute of Metallurgy, Academy of Sciences USSR, and Krasnoyarsk Institute of Nonferrous Metals; Ordzhonikidze, Investiya Vysshikh Uchebnykh Zavedniy, Tsvetnaya Metallurgiya, No 1, 1960, pp 145-149

Studies were made of the effect of varying amounts of s-phase (Al_2MgCu) on the heat resistance of high-melting Al-Mn alloys containing 1.5% Mn and with Cu and Mg content varying from 1.3 to 4.5 and 0.5 to 2%, respectively (0.1% Ti was added to test specimens of this group for grain refinement). Tests at room temperature showed that increase of s-phase content results in uniform increase in strength and hardness and rather sharp decrease in ductility. At elevated temperatures (up to 300°C) strength characteristics increased with increase of s-phase content up to 5.5% but further alloying with Cu and Mg showed almost no effect. Hot and long duration hardnesses increase continuously with increase of s-phase content but at a lower rate at elevated temperatures. Ductility of highly alloyed alloys increases noticeably with increase of testing temperature; however, the general tendency toward decreased ductility with increase of s-phase content at high temperatures is preserved. Tests at 250°C for 100 hours and over showed that the best properties are displayed by alloys of aluminum with 1.5% Mn containing 7.8% of s-phase (3.5% Cu and 1.5% Mg).

140. Surface Tension and Density of Liquid Platinum

"Measurement of the Surface Tension and Density of Liquid Platinum," by V. N. Yeremenko and Yu. V. Naydich; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniya Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 6, Nov/Dec 59, pp 129-131

Procedures used in measuring the surface tension and density of liquid platinum are described. The surface tension of liquid platinum at melting point temperature in a vacuum of 2×10^{-5} mm Hg was measured to be 1,740 ± 20 ergs/cm^2, and the density, 19.7 ± 0.25 g/cm^3.

141. Phase Diagram of System $TiFe_2$-V

"Phase Diagram of the System $TiFe_2$-V," by Pi Ch'ing-hua and I. I. Kornilov; Moscow, Izvestiya Akademii Nauk SSSR Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 6, Nov/Dec 59, pp 110-112

A phase diagram of the system $TiFe_2$-V was constructed on the basis of results of thermal and microstructural analyses and investigations of hardness. It was proved that this system is quasibinary and forms a eutectic with a melting point of 1,400°C. Components of the system $TiFe_2$-V are mutually soluble and, correspondingly, two single-phase regions (γ_1 and β) and one two-phase region ($\gamma_1 + \beta$) exist. Solid solutions on a $TiFe_2$(γ_1) base exhibit an increase of hardness with increase of vanadium content.

142. Studies of Binder Phase in Tungsten Carbide-Cobalt Alloys

"X-Ray Examination of the Structure of the Binder Phase in Tungsten Carbide-Cobalt Alloys," by A. Ye. Koval'skiy and L. Kh. Pirovarov; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 6, Nov/Dec 59, pp 113-120

X-ray studies of various tungsten carbide-cobalt alloys prepared by powder metallurgy methods at different sintering temperatures showed that the binder phase is a solid solution of tungsten carbide (and possibly carbon if sintered in a carburizing medium) in cobalt. The quantity of tungsten carbide in the cobalt solid solution does not depend on the amount of cobalt in the alloy charge but on the sintering conditions; alloys sintered at higher temperatures contain a larger amount of tungsten carbide in solution with cobalt. The rate of cooling after sintering also leads to a different content of tungsten carbide in the cobalt phase, as is disclosed by a change in the lattice period. Special heat treatment (tempering) after sintering leads to a decomposition of the solution which is analogous to the effect of slowed cooling after sintering. The thin film of binder phase formed on the surface of these alloys during sintering increases in thickness with increased content of cobalt in the charge. With increase of sintering temperature, the amount of cobalt phase at the surface decreases. Grain size of the cobalt phase is many times greater than that of tungsten carbide and increases with increase of cobalt in the alloy.

143. Investigation of Alloys of System WSi_2-$NbSi_2$

"Concerning Certain Properties of Alloys of the System WSi_2-$NbSi_2$," by N. V. Dokukina, M. D. Polyakova, and F. M. Shamray; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 6, Nov/Dec 59, pp 102-109

The structure and properties of alloys of the system WSi_2-$NbSi_2$ were investigated to construct elements of the phase diagram of this system. It was shown that alloys containing less than 59.2% $NbSi_2$ are single-phased and two-phased when the $NbSi_2$ content is over 59.2%. Alloys on a $NbSi_2$ base have a wide region of solid solutions which extends up to approximately 40.8% WSi_2 at room temperature. When heated to 1,100-1,200°C, alloys of the WSi_2-$NbSi_2$ system become coated with a loose film of oxides which does not offer protection against further oxidation.

144. Studies of Diffusion Coatings of Silicon on Niobium

"Concerning the Structure and Phase Composition of Diffusion Coatings of Silicon on Niobium," by P. M. Arzhanyy, R. M. Volkova, and D. A. Prokoshkin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 6, Nov/Dec 59, pp 127-129

Results are presented of investigations of the structure and phase composition of commercially pure niobium saturated with silicon from a solid phase at 1,100-1,300°C for periods of 0.5-15 hours. The coating formed consists of the following three distinct layers:

1. A thick bright outer layer containing approximately 37% silicon in the form of $NbSi_2$ having a hexagonal lattice. Microhardness of this layer is 1,050 kg/mm^2.

2. A thin bright inner layer making up approximately 14% of the total thickness of the coating and containing approximately 15% silicon in the form of Nb_5Si_3 having two types of tetragonal lattices and a hexagonal lattice. Microhardness is 700 kg/mm^2.

3. An inner well-defined layer containing approximately 7% silicon in a form corresponding to the compound Nb_4Si but of undetermined crystal structure.

The duration of saturation periods has no effect on either the microstructure or phase composition of the coating. Thickness ratios for the individual layers of the coating are preserved. The coating is chemically stable but is brittle and fails under stress at high temperatures.

145. Hot-Shortness of Copper Alloys

"Study of the Hot-Shortness of Copper Alloys," by I. I. Novikov and L. I. Dautova, Trudy Instituta Yadernoy Fiziki Akademii Nauk KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR), No 1, 1958, pp 255-264 (from Referativnyy Zhurnal--Metallurgiya, No 6, Jun 59, Abstract No 13370)

Copper-tin and copper-nickel-silicon alloys were cast into graphite forms to produce specimens with diameters of 4-16 millimeters. The square of the diameter of the specimen, the contraction of which caused hot surface micro- and macro-fissures in the area of a change of cross section near the head of the specimen, was used as a measure of hot-shortness. A connection was established between hot-shortness and the phase diagrams of the alloys. Hot-shortness was connected with the value of the effective temperature interval of the solid-liquid state in which the alloy has low strength and insignificant ductility. The second maximum on the hot-shortness-composition curve results from strong zonal liquation. The properties of alloys with maximum hot-shortness and with maximum inclination toward zonal liquation generally do not coincide.

146. Nonmetallic Inclusions in High-Temperature Steel

"Nonmetallic Inclusions and Certain Phases in a Heat-Resistant Steel," by M. D. Shul'vas, Trudy Nevskogo Mashinostroitel'nogo Zavoda (Works of the Neva Machine Building Plant), No 4, 1958, pp 172-183 (from Referativnyy Zhurnal--Metallurgiya, No 6, Jun 59, Abstract No 13270)

The method and results are reported of a study of nonmetallic inclusions in specimens of heat-resistant steel taken from the upper portion of a turbine. The chemical composition of the steel is not given; mention is made only of the presence of titanium, tungsten, and cobalt. The steel was transformed into the austenitic state at 1,170 degrees for 4 hours and stabilized for 10 hours at 770 degrees. The nonmetallic inclusions were isolated by electrolytic dissociation in a saturated solution of NaCl with a 20-percent solution of HCl. It was found that nonmetallic oxide inclusions occur in quantities which are normal for steels of similar types and consist generally of silicates and oxides of aluminum. The complex sulfides contain iron, molybdenum, and nickel. Titanium is present in the form of titanium nitrides (0.053 percent) with titanium carbide inclusions (0.04 percent).

147. Rapid Spectral Analysis of High Alloy Steel

"Express-Analysis of High Alloy Steels by the Spectral Method," by L. V. Klimovich, Trudy Nevskogo Mashinostroitel'nogo Zavoda (Works of the Neva Machine Building Plant), No 4, 1958, pp 189-196 (from Referativnyy Zhurnal--Metallurgiya, No 6, Jun 59, Abstract No 14114)

A method of rapid spectral analysis of high alloy steel, based on the use of a control standard for three components, was devised. The control used is a prepared sample which has been previously analyzed chemically and checked by spectral analysis for homogeneity. Photographs were made of the spectra of the ISP-22 spectrograph; IG-2 and DG-1 generators were used. A copper rod was used as a counterelectrode. Magnesium, chromium, nickel, molybdenum, cobalt, and titanium were determined in the spark system, and silicon in the arc system. A stepwise clearing agent was used. Chromium, nickel, and manganese were determined in the concentration range of 5-17 percent. This method was used during the alloying of EZh2, EZh3 steel, high-chromium steels EI316 and 25-12, heat-resistant steels LAZ and LA1, acid-resistant steels EYa1T, 16-13-3, and high-manganese steel. The relative error in the determination of chromium in EZh2 and EZh3 steels averaged 2 percent, but was 6 percent in the manganese determinations. The manganese determination in Hatfield steel was within 2-3 percent. A comparison of the results of a spectral and a chemical analysis showed that the two types differed by no more than 2 percent. The analysis can be made in 30 minutes.

148. Electrolytic Deposition of Zirconium on Liquid Zinc Cathode

"Depositing Zirconium on a Liquid Zinc Cathode," by I. F. Nichkov, A. V. Volkovich, and S. P. Raspopin, Ural Polytechnic Institute; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, No 1, 1960, pp 128-132

Results are given of tests of the electrolytic deposition of zirconium on a liquid zinc cathode. It was found that at a temperature of 700°C and cathode current density of 0.6 amps/cm^2, approximately 90% of the zirconium in the chloride-fluoride melt is deposited out. Investigations of the alloy obtained established that zinc and zirconium form the intermetallic compound $ZrZn_{12}$.

149. Metals for Impeller Pumps Operating on Sulfur Anhydride

"Metals for Impeller Pumps Operating on Sulfur Anhydride," by B. M. Idel'chik, A. A. Chikurova, and V. V. Skorchelletti, Trudy Nevskogo Mashinostroitel'nogo Zavoda (Works of the Neva Machine Building Plant), No 4, 1958, pp 197-208 (from Referativnyy Zhurnal--Metallurgiya, No 6, Jun 59, Abstract No 13263)

A report is given of the results of an inspection of the condition of impeller pumps used for transporting SO_3 and various parts of them after extensive use in the production of H_2SO_4, and also the results of an investigation of the corrosion rate of specimens of 21 materials (carbon steel and alloyed structural steel, stainless steel, special alloys, cast iron, bronze, copper, aluminum, and the silicon-aluminum alloy, Silumin) under manufacturing conditions (in the exhaust gas lines of a final cleaning apparatus). As a result of the inspection, it was determined that the average service life of the rotor of impeller pumps is 5 or 6 years, independent of the material; the blades were made of N5A steel (0.15 percent carbon, 4.95 percent nickel) and of Kh17 steel with molybdenum (0.12 percent carbon, 18.0 percent chromium, 2.3 percent molybdenum, and 0.65 percent titanium). The breakdown of the blades resulted not only from corrosion, but also from the impingement of droplets of H_2SO_4. Inasmuch as the blades of Kh17 steel with molybdenum operated under more severe conditions, this steel should be given preference as material for the rotor blades.

The investigations show that the corrosion rates of steel 45, cast iron, and stainless chromium-steel are almost the same. Stainless chromium-nickel steels are more resistant to corrosion. The best results were obtained with Kh17M steel and ferrosilicon. Nonferrous alloys were subject to considerable corrosion. A junction of N5A steel with high alloy steel had no influence on the corrosion rate; the corrosion resistance of Kh17M and Kh18N9T steels increased somewhat when forming a junction with N5A steel. The corrosion rate of steel 45 increases when in contact with high alloy steels, which likewise corrode at a slightly more rapid rate at the same time. A contact of N5A and steel 45 does not change the corrosion rate. The corrosion rate of steel 45 and N5A steel is effected by temperature and the humidity of the gas; their corrosion resistance is satisfactory when the values of these parameters are low.

150. Heat-Resistant LAZ Steel for Cast Steam Fittings

"The Development and Application of Heat-Resistant Steel LAZ," by Ye. Ye. Levin, Ye. N. Masaleva, and K. M. Lysenko, Trudy Nevskogo Mashinostroitel'nogo Zavoda (Works of the Neva Machine Building Plant), No 4, 1958, pp 40-50 (from Referativnyy Zhurnal--Metallurgiya, No 6, Jun 59, Abstract No 13289)

A description is given of the development and industrial application of heat-resistant steel LAZ for cast steam fittings for operating temperatures up to 580°C and pressures up to 170 atmospheres. Information is given on the chemical composition, mechanical properties, macro- and micro-structure, stability properties and texture, heat-resistance properties, casting procedure, and behavior during use. LAZ steel in industrial melts consists of 0.13-0.2 percent carbon, 0.48-0.74 percent manganese, 0.39-0.54 percent silicon, 13.0-14.6 percent chromium, 13.2-14.2 percent nickel, 1.54-2.38 percent molybdenum, 1.43-1.70 percent tungsten, 0.35-0.50 percent vanadium, 0.21-0.27 percent titanium, 0.40-0.52 percent niobium, 0.018-0.25 percent sulfur, and 0.018-0.025 percent phosphorus; it is normalized at 1,180-1,120°C, annealed at 780-800°C with quenching in air, and has the following guaranteed mechanical properties at 600°C: σ_g = 13.0 to 18.0 kg/mm^2; σ_b = 30.0 to 40.0 kg/mm^2, δ = 18-26 percent, a_k = 6.0-8.5 kgm/cm^2; and heat-resistant properties at 580°C: σ_{pl} = 12 kg/mm^2 (one percent after 10,000 hours), σ_{dl} = 15 kg/mm^2 100,000 hours).

151. Soviet Experimental Alloy With Superior Scale-Resistance

"Thermal Stability of Certain Nickel-Base Alloys," by A. A. Sovalova and Z. I. Kornilova, Trudy Moskovskogo Aviatsionnogo Tekhnologicheskogo Instituta (Works of the Moscow Aviation Technological Institute), No 31, 107-112 (from Referativnyy Zhurnal - Metallurgiya, No 6, Jun 59, Abstract No 13888)

A study was made of the scale resistance of nickel-base alloys EI437B, EI617, and an experimental alloy; an iron-base 21-11-2.5 alloy was used for comparison. Alloys EI437B and EI617 formed scales at an equal rate at 850 and 950 degrees centigrade. At 1,150 degrees centigrade, alloy EI617 is less stable (0.66 gram per square meter per hour) than EI437B (0.56 gram per square meter per hour). The scale resistance of the experimental alloy at 1,150 degrees centigrade is four times better than that of the EI437B, and ten times greater than that of 21-11-2.5 steel. During the oxidation process, the alloys are covered with a dense, viscous film; one exception is steel 25-11-2.5, on which a scale forms which is

easily removed from the surface. When the oxidation temperature is increased from 850 to 1,050 degrees centigrade, the structure of the scale produced on the EI437B, EI617, and 21-11-2.5 changes. The investigations confirm the well-known condition that these elements with the greatest affinity for oxygen (aluminum, chromium, etc.) spread from the internal layers of the metal to the surface, and their concentration in the scale is greater than in the alloy.

IX. PHYSICS

Electricity and Magnetism

152. Hall Effect in Ferromagnetics

"Temperature Dependence of the Hall Effect in Pure Ferromagnetics," by N. V. Volkensteyn and G. V. Fedorov, Institute of Physics of Metals, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 64-68

The paper presents results of measurements of the Hall effect for iron, nickel, and cobalt 99.998% pure in a wide temperature range from room temperature down to 4.2°K. It is shown that the existing theories are inadequate for satisfactory explanation of the experimental data obtained for R_0 and R_s temperature dependence in a wide temperature range.

153. Electromagnetic Waves Through Metals

"The Possibility of Passage of Electromagnetic Waves Through Metals in a Strong Magnetic Field," by O. V. Konstantinov and V. I. Perel, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 161-164

It is shown that an electromagnetic wave traveling along a magnetic field can penetrate through a metal plate held perpendicular to the field provided the Larmor frequency exceeds the wave frequency and is much higher than the collision frequency and the Larmor electron radius is smaller than the length of the wave in the metal.

154. Conductivity of Dielectrics

"Electric Conductivity of Dielectrics in Strong Shock Waves," by A. A. Brish, M. S. Tarasov, and V. A. Tsukerman; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 22-25

The electrocontact method was used to measure the electric conductivity of air, water, and some solid dielectrics when acted upon by strong shock waves. The measured value of air conductivity on the shock-wave front was found to be 0.5 Ω^{-1} cm^{-1}, and of water

conductivity, 0.2 Ω^{-1} cm^{-1}. It is shown that at shock-wave front pressures close to 1.10^6 kg/cm^2 organic glass and paraffine conductivity rises to $1 \div 2 \cdot 10^2$ Ω^{-1} cm^{-1} and approaches that of metals.

155. Ratio of Electric Resistance to Galvanometric Effect

"Relation of the Electric Resistance Temperature Dependence at Low Temperatures to the Galvanomagnetic Effect in Strong Magnetic Fields," by O. S. Galkina and L. A. Chernikova, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 3-6

A study was made of the electric resistance of nickel-copper alloys with 39.6, 44.55 or 49.6% of Cu in the 7-30°K temperature range. By applying the $T^{3/2}$ law to temperature dependence of spontaneous magnetization I_s, specific resistivity ρ can be related to ferromagnon concentration $n = 1 - I_s / I_0$ (I_0 - intensity of magnetization for $T \longrightarrow 0$) and the numerical value of the coefficient $(\rho - \rho_0)/n$ can be obtained (ρ_0 - residual resistance).

Comparison of this coefficient's value with $\Delta\rho/\Delta n$ ($\Delta\rho$ and Δn) denotes variations of ρ and n caused by changes of true magnetization in strong magnetic fields) demonstrates that these values are of the same order within the margin of error of measurement. This fact is regarded as indirect confirmation of the assumption that resistance of ferromagnetic alloys at low temperatures is related to electron scattering on the irregularities of the lattice magnetic moments.

156. Magnetization of an Antiferromagnetic

"Approximate Method for Calculating the Magnetization of an Antiferromagnetic," by Pu Fu-chuoh, Mathematics Institute imeni Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 3, Mar 60, pp 546-548

By means of spectral representation of Green's functions, according to the method by N. N. Bogolyubov and S. B. Tyablikov (DAN, 126, 53, 1959), formulas are derived for magnitudes of relative magnetization of each sublattice and the cosine of the angle of the magnetization vector of the sublattice and the direction of the magnetic field.

157. Ferrimagnetism of Nonstoichiometric Iron Sulfides

"On the Ferrimagnetism of Nonstoichiometric Iron Sulfides," by R. Perthel, Institute of Magnetic Materials, Jena; Leipzig, Annalen der Physik, Vol 5, No 5/6, 1960, pp 273-295

Magnetic studies were made on synthetically produced iron sulfides of the composition FeS_{1+n} $(0 \leq n \leq 0.15)$. Particular interest was devoted to the ferrimagnetic range ($\approx$ $0.10 < n < 0.15$). With the aid of the order-disorder theory of Bragg-Williams (Proc. Roy. Soc. London, (A) 145, 699, 1934; (A) 151, 540, 1935), the experimentally obtained results can be understood, assuming that at T = 0 both the Fe^{+++} -ions and the vacancies can occupy positions in only one of the two sublattices.

Attempts to substitute cobalt, nickel, or copper, partially or completely, for the iron in the ferrimagnetic sulfide $FeS_{1.15}$ were successful only in the case of cobalt. Up to $Fe_{0.5}Co_{0.5}S_{1.5}$, the mixed sulfides are ferrimagnetic; with higher cobalt content, they become antiferromagnetic.

A careful oxidation of the sulfides shows that, initially, some oxygen can be incorporated into the partial lattice of the sulfur before the lattice collapses and iron oxide is produced.

Mechanics

158. Cavitation Flow of an Ideal Incompressible Liquid in a Slot

"Cavitation Flow of an Ideal Incompressible Liquid in a Slot," by G. N. Pykhteyev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 157-161

The article considers a two-dimensional flow of an ideal incompressible weightless fluid flowing into a slot of infinite length, inside which a cavitation cavern is formed -- a region of constant pressure bound by a flow line which separates from the edge of the slot and extends toward the second sheet of a Riemann surface. The mathematical treatment involves the determination of the complex potential, a determination of the parameters, the configuration and dimensions of the cavern, and the coefficient of contraction.

159. Influence of Core Boundary on Nonsteady-State Viscous-Plastic Flow

"Nonsteady-State Flow of a Viscous-Plastic Material in a Circular Tube," by A. I. Safronchik, Saratov; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 149-153

The problem is stated and solved for a flow of viscous-plastic material in a circular tube of given radius under the effect of a given pressure drop. The tube is assumed to be of sufficient length to allow the end effects to be neglected; the tube material is infinitely inelastic, and the viscous-plastic material is incompressible.

The solution of an analogous problem by Krasil'nikov (Prikladnaya Matematika i Mekhanika, Vol 9, No 1, 1956) is considered inaccurate by the author, since Krasil'nikov's presentation of the problem fails to account for the influence of the boundary of the axial core of flow on the development of the flow of the viscous-plastic material.

160. Correlation of Anisotropy and Hardening Effects in Plastic Material

"On the Correlation Properties of the Rule of Anisotropic Hardening of a Plastic Material," by D. D. Ivlev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 144-146

Prager's hardening rule is considered on the basis of the formulation of Shield and Ziegler (ZAMP, 9a, 1958). It is shown that, within the assumptions of the above formulation, an anisotropically hardening body leads to equations of a hyperbolic type by expanding the qualitative flow properties of an ideal plastic material to include the case of hardening bodies. The relationships are considered which apply to both the two-dimensional and three-dimensional cases. In the latter case, it is assumed that the stressed condition corresponds to the conditions of flow at the edge of a prism, which generalizes the Tresk plasticity condition in accordance with Shield and Ziegler.

The obtained results show that the simultaneous consideration of the effects of anisotropy and hardening contributes to a more precise formulation of the mathematical problem.

161. Theory of the Prandtl-Mayer Type of Motion

"On the Theory of Motions of the Prandtl-Mayer Type," by K. B. Pavlov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 165-168

A flow is considered in which the portion moving in the direction of the edge has parameters which are initially nonuniform, such as occurs in the presence of a frontal shock wave, the intensity of which decreases with distance from the body.

162. Laminar Boundary Layer on an Infinite Disk Rotating in a Gas

"Laminar Boundary Layer on an Unbounded Disk Rotating in a Gas," by V. P. Shidlovksiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 161-164

In the dynamics of a viscous imcompressible liquid, the solution of the well-known Karman (ZAMM, Vol 1, 1921, p 235) problem of the infinite disk rotating with a constant angular velocity represents an example of a rigorous solution of the Navier-Stokes equation, whereas the problem of the heat transfer in the liquid, with a constant temperature of the disk surface, was rigorously solved by Millsaps and Pohlhausen (Journ. Aeronaut.Sci., Vol 19, No 2, 1952). This article shows how the solution of the corresponding gas-dynamics problem, for specific conditions and simplifications, can be reduced to the solution of the two above-mentioned problems.

163. Nonsteady Supersonic Flow Around Wing of Infinite Span

"On the Theory of Nonsteady Supersonic Flow of a Gas Around a Wing of Infinite Span," by A. D. Lisunov, Novosibirsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 166-168

The results of the mathematical formulation given here can be used for solving problems connected with the determination of the aerodynamic forces exerted on an elastic wing of infinite span as a result of an arbitrary aperiodic perturbation. The method can be used particularly for the calculation of the air loads exerted on an aircraft as it enters a vertical gust of arbitrary three-dimensional form.

164. Turbulent Boundary Layer of an Imperfect Compressible Gas

"On the Turbulent Boundary Layer of an Imperfect Compressible Gas," by I. I. Mezhirov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 93-99

The equations are derived for the turbulent boundary layer of an imperfect gas (for example, dissociated air). It is shown that the relationships which apply for a perfect gas, and are derived solely from the equations of motion, continuity and energy, may be generalized for the case of an imperfect gas by a formal substitution in them of enthalpy for temperature. Examples of such relationships are given.

165. Separation of Hyperbolic Flow Around Angular Points

"Two-Dimensional Flows of an Ideal Gas With Infinite Electrical Conductivity in a Magnetic Field Which Is Not Parallel to the Velocity of Flow," by M. N. Kogan, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 100-110

This article presents an analysis and classification of certain types of hyperbolic and elliptical-hyperbolic flows. It is shown that, in the case of a hyperbolic flow around angular points, a reversal of flow takes place successively at two compression jumps or rarefaction waves. A method is given of computing such flows. It is shown that elliptical-hyperbolic flows can separate into an elliptical decaying and a hyperbolic infinitely nondecaying component, and a study is made of the nature of these flows. It is further shown that, in the presence of a magnetic-field component perpendicular to the flow, the perturbations caused by the currents are not shielded by the flow. When there is a weak perpendicular field in the vicinity of the flows in an ideal infinitely conducting fluid, a magnetic boundary layer is formed.

166. Propagation of Strong Shock Waves

"The Use of Integral Relationships in Problems of the Propagation of Strong Shock Waves," by G. G. Chernyy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 121-125

The investigation of nonself-modeling motions of a gas which are produced during the propagation in the gas of spherical, cylindrical, and plane shock waves involves complex, laborious calculations which are practically feasible only in a small number of cases (such as the case

of a point explosion [Okhotsimskiy, et al., Trudy matematicheskogo instituta AN SSSR, Vol 50, 1957]). Earlier works by the author (Doklady AN SSSR, Vol 107, No 5, 1926; Ibid., Vol 112, No 4, 1957; Izvestiya AN SSSR, Otdeleniye Tekhnicheskikh Nauk, No 3, 1957) used for the calculation of these motions an approximation method which is suitable for a strong compression of the gas during the shock wave, i.e., during the propagation by the gas of an intense shock wave. This method is based on a representation of the gas dynamic values as a special series corresponding to the stages of the parameter, which characterizes the relationship between the density of the gas in front of the shock and the density behind the shock. The successive terms of the series are derived from the equations by means of quadratures. For the case when the first two terms of the series are retained, the gas parameters in the turbulence region beyond the shock are expressed (Chernyy, G. G., Izvestiya AN SSSR, Otdeleniye Tekhnicheskikh Nauk, No 3, 1957) by the function $R^*(t)$, which describes the law of propagation of the shock wave. The law of the conservation of energy in integral form, applied to the entire region of turbulent motion of the gas, can be used for the determination of the above function in problems involving motions produced during an explosion in a gas and during the propagation in a gas of a mobile boundary (piston).

167. Equations of One-Dimensional Magnetohydrodynamics in the Case of Shock Waves

"Some Solutions of Equations of One-Dimensional Magnetohydrodynamics and Their Application to the Problem of the Propagation of Shock Waves," by V. P. Korobeynikov and Ye. V. Ryazanov, Moscow, Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 111-120

Cases are treated, where it is possible to integrate the equations which express the one-dimensional motions of an electrically conducting gas, with both cylindrical and plane symmetry, with a more detailed treatment of the case of cylindrical symmetry. A general solution is found for the equations of infinitely conducting steady-state motions, and a brief description is given of the corresponding flows.

Unsteady, self-modeling and nonself-modeling motions, accompanied by shock waves, are considered. A method is given for correlating solutions extending from the steady-state through the shock wave. Concrete problems are solved which can be applied to the theory of impulsive gas discharge.

168. Application of Mises Variable in Propagation of Jet Along Wall

"The Application of the Variable of Mises to the Problem of the Propagation of a Laminar Jet Along a Wall," by N. I. Akatnov, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 154-156

A semi-infinite plate is considered, in the tip of which there is an infinitely thin source, a slot, from which a jet of liquid is ejected along one side in such a way that the liquid completely fills the space surrounding the plate. The liquid in the surrounding space moves at a constant velocity in the direction of flow of the jet, forming a flow concurrent with that of the jet. The boundary layer equation of Mises is used in the solution of the problem of the propagation of the jet together with the secondary (concurrent) flow.

The article also treats the case of the propagation of the jet without the concurrent flow and provides an asymptotic solution of the problem of the propagation of the jet together with the concurrent flow.

169. Slight Discontinuities in Magnetohydrodynamics

"On the Solution of the Equations of Magnetic Gas Dynamics," by I. M. Yur'yev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 168-170

The equations of a two-dimensional flow in a magnetic field parallel to the velocity field are transformed, for certain initial conditions, into a linear equation of the Chaplygin type. The result is applied to the case in which discontinuities are not strong.

170. Early Setting of Gyrocompass on the Meridian

"On Placing a Gyroscopic Compass on the Meridian at the Time the Gyroscope Rotors Are Accelerated," by Ya. N. Roytenberg, Moscow, Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 1, 1960, pp 88-92

Generally, after it has been started, a gyrocompass is fixed on the meridian by the application of additional external forces. The choice of a method of controlling these forces can require that the gyrocompass be fixed on the meridian during a certain earlier interval of time. To improve the state of readiness, it seems expedient to begin the setting of the compass on the meridian as early as the time the gyroscope rotors are accelerated. Here, the problem of a gyrocompass with variable kinetic (natural) gyroscopic moments is treated as in an earlier work by the author ("On an Accelerated Fixing of a Gyrocompass on the Meridian," Prikladnaya Matematika i Mekhanika, Vol 23, No 5, 1959).

171. Fast Reactor Design

"A Method of Averaging the Constants With Allowance for Neutron Values for Calculations on a Fast Reactor," by A. I. Novozhilov and S. B. Shikhov; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 209-213

The method of averaging many group constants for a one-group computation of the critical size or critical mass of a two-zone fast reactor is outlined. The accuracy of the method, checked on an example of solution of nine-group spatial problems, appears to be so high that the solution of a spatial many group problem becomes superfluous for the computation of the critical mass of a two-zone reactor with a thick screen. Results of computations are reported. The method provides essential simplification of computation of fast reactors, as compared to computation of spatial many-group diffusion.

172. New Cyclotron Design

"Acceleration of Ions in a Cyclotron With an Azimuthally Varying Magnetic Field," by R. A. Meshcherov, Ye. S. Mironov, L. M. Nemenov, S. N. Rybin, and Yu. A. Kholmovskiy; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 201-208

Experiments in the accelerating of charged particles in an azimuthally varying magnetic field on the 1 1/2 meter cyclotron of the Institute of Atomic Energy of the Academy of Sciences USSR are described. The creation of a magnetic field of the sectional type with a variation depth of $\sim \pm 15\%$ at a 15-kilovolt voltage between the dees permitted a deuteron acceleration up to 19 Mev energy. The study of ion motion on final orbits indicated the possibility of extraction of a larger part of the ion beam at an energy considerably exceeding 20-22 Mev by means of an electrostatic deflecting system. The relations characterizing the acceleration processes under conditions of an azimuthally varying magnetic field were established. Valuable experience was acquired in corrections of the magnetic field shape by electric coils located inside the accelerating chamber.

173. New Cyclotron Design

"A Cyclotron With a Spatially Varying Magnetic Field," by D. P. Vasilevskaya, A. A. Glazov, V. I. Danilov, Yu. N. Denisov, V. P. Dzhelepov, V. P. Dmitriyevskiy, B. I. Zamolodchikov, N. L. Zaplatin, V. V. Kolga, A. A. Kropin, Liu Nei-Ch'uan, V. S. Rybalko, A. S. Savenkov, and L. A. Sarkisyan; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 189-200

The basic deductions of the linear theory of motion of charged particles in a magnetic field with a periodic structure in radius and azimuth are presented for the design of a cyclotron with spatially varying magnetic field. Theoretical and experimental results from the studies of the nonlinear resonance near the center of the accelerator are described. Formulas for the computation of the required configurations of the magnetic fields are derived. The methods for shimming and for the measurement and stabilization of the magnetic field are described. The designed accelerator with pole shoes 120 cm in diameter was used for modeling the phase motion of ions and for the study of space stability. Deuterons were accelerated up to 13 Mev energy at an amplitude of the accelerating voltage of 5 kv.

174. Electron Delocalization

"A Measure of the Delocalization of an Electron in an Atomic Molecular System," by D. A. Bochvar and N. P. Gambaryan, Institute of Organoelemental Compounds; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 3, Mar 60, pp 532-534

Based on the Born interpretation of the square of the modulus of the wave function of a system of n particles as density of probability of the configuration of the system, it is possible to apply the latest general concept of the probability theory of entropy of a random magnitude for the description of a quantum mechanical system.

175. Star-Producing Component of Cosmic Radiation in Lead

"On the Transition Effect of the Star-Producing Component of Cosmic Radiation in Lead," by I. Hauser, P. Landrock, K. Lanius, L. Mitrani, and A. Peeva, Institute of Nuclear Physics, Zeuthen-Berlin and Physics Institute, Bulgarian Academy of Science, Sofia; Leipzig, Annalen der Physik, Vol 5, No 5/6, 1960, pp 335-338

The transition effect of the star-producing component of cosmic radiation was investigated behind lead at an altitude of 3,000 meters (on the Vrah Stalin in Bulgaria). A maximum frequency of occurrence of stars behind 1-2 centimeters of lead was not observed. The results are in agreement with theory.

176. Neutron-Producing Component of Cosmic Radiation in Lead

"On the Transition Effect of the Neutron-Producing Component of Cosmic Radiation in Lead," by I. Hauser, Institute of Nuclear Physics, Zeuthen-Berlin, Leipzig, Annalen der Physik, Vol 5, No 5/6, 1960, pp 327-334

The transition effect of the neutron-producing component of cosmic radiation in lead was studied with boron-doped Agfa K3 emulsions with a boron content of 0.063 gram per cubic centimeter via the reaction $B^{10}(n, \alpha)Li^{7}$, and an integral intensity measurement was made. The absorber used consisted of three concentric lead cylinders 50 centimeters high. The spaces between them, and the inside space, were filled with paraffin. The inner paraffin cylinder had an axial hole in which the plate holder, consisting of brass sheet one millimeter thick, was positioned. The emulsions (3 cm x 6 cm x 100 microns) were inserted vertically into the plate holder.

The measurements were made with lead cylinders with wall thicknesses averaging 5.9, 12.1, and 24.4 millimeters. The exposure lasted 38 days at a height of 2,630 meters above sea level (Lomnicky Stit). The absorbers were sheltered by a wooden roof about 0.8 gram per centimeter square, covered with aluminum sheet one millimeter thick. The zero effect was measured with a device containing no lead. A control plate was developed before each exposure.

The results obtained show a smooth neutron-production curve. No indication could be found of a maximum between one and two centimeters of lead, which has been reported by others (S. B. Treiman and W. Fonger, Physical Review, Vol 85, 1952, p 364; H. M. Weiss, Z. Naturforschg, 10a, 1955, p 21).

177. Anti-Sigma-Minus-Hyperon Discovery

"Photographed Antimatter" (unsigned article); Berlin, National-Zeitung, 2 Apr 60, p 7

A group of scientists of the energetics laboratory of the Dubna Joint Institute for Nuclear Research, which includes Prof Wang Kang-chiang (China), V. I. Veksler (USSR), and other scientists from Vietnam, China, Korea, Poland, Rumania, the USSR, and Czechoslovakia, discovered a new and heretofore unknown nuclear particle, the "anti-sigma-minus-hyperon." This nuclear particle, discovered in March 1960, belongs among the particles of antimatter. The newly discovered particle has a positive charge; its mass is nearly 2,300 times that of the electron; it lasts one ten-millionth of a second and then disintegrates into an antineutron and a positively charged pi-meson. From a total of 40,000 photographs, made with a propane-bubble chamber exposed to synchrophasotron radiation, the scientists made the first clear observation of this charged antihyperon.

[For additional information, see Engineering.]

Solid State Physics

178. Magnetic Structure of Cobalt

"The Dependence of the Magnetic Structure of the Cobalt Crystal on its Size," by G. S. Kandaurova, Ya. S. Shur, and F. B. Maslennikova, Ural State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 60-63

The paper gives the results of the powder-pattern observations of the changes in magnetic structure of a cobalt monocrystal on its basic plane as the crystal thickness was decreased from 515 to 15 μ. It has been established that at small thicknesses (below 200 μ), the domain width changes proportionally to the square root of the crystal thickness; at greater thicknesses, deviations from this regularity are observed.

179. Microscopic Aluminum Parameters

"Determinations of Microscopic Parameters of Aluminum From Its Optical Constants and Electric Conductivity," by A. I. Golovashkin, G. P. Motulevich, and A. A. Shubin, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 51-55

Measurements were made of optical constants of aluminum in the 0.8-9 μ range at room temperature and at liquid nitrogen temperature. Static conductivity and density of the same specimens were also measured. The data obtained were evaluated using the theory which is based on the quantum kinetic equation and takes into account the electron-electron collisions. Concentration of conduction electrons, electron velocity on the Fermi surface, and electron collision frequency were determined.

180. Magnetic Structure in Monocrystals

"Magnetic Structure in Small Monocrystalline Particles of MnBi Alloy," by Ya. S. Shur, Ye. V. Shtolts, and V. I. Margolina, Institute of Physics of Metals, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 46-50

The magnetic structure of various-sized particles (from 100 down to a few microns) of a manganese-bismuth alloy was studied by the powder-pattern method. It was found that with the particle size decreasing, the type of magnetic structure changes regularly. In particles several microns and less in size, one-domain magnetic structure was detected.

181. p - n Junctions

"Capacitance of p - n Junctions at Low Temperatures," by B. M. Vul and E. I. Zavaritskaya, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental-noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 10-17

The p-n-junctions in germanium and silicon rectifiers have not been detected at low temperatures by capacitance measurements on the rectifiers. But from theoretical consideration, it follows that, despite the low temperature, almost all the impurities in the region of the junction are ionized and that the potential barrier on the p-n junction is equal to the

forbidden energy gap of the semiconductor. It is shown that the observed dependence of the capacitance and other dielectric properties of the rectifier upon the temperature can be derived using a simple equivalent circuit. Some conclusions from the capacitance vs. voltage measurements are also drawn about the inversion layers of carriers in the space charge region of p-n junctions.

182. Absorption of Ultrasonic Waves

"Contribution of the Theory of Absorption of Ultrasonic Waves by Metals in a Strong Magnetic Field. I.," by E. A. Kaner; Moscow, Zhurnal Eksperimental'noy i Teoretichskoy Fiziki, Vol 38, No 1, Jan 60, pp 212-218

The absorption coefficient α of ultrasonic waves in metals in strong magnetic fields is calculated for $r \ll \lambda \ll l$ (r, l are the characteristic orbital radius and mean free path of electrons; λ is the length of the sound wave in the metal). Closed electron orbits are considered under an arbitrary law of electron dispersion. It is shown that in a strong field, the value of α becomes saturated independent of whether $n_1 = n_2$ or $n_1 \neq n_2$. At $K \perp H$ (k - wave vector, H-magnetic field, n_1, n_2 - numbers of "electrons" and "holes"), the saturation value is $kl \gg$ one times greater than the value $\alpha = \alpha_0$ at $H = 0$ and in all other cases $\alpha \sim \alpha_0$. Comparison of theory with experiment shows good agreement.

183. Fine Spectral Structure of Ti

"An Investigation of the Temperature Dependence of the Fine Structure of the Main Edge of the X-Ray Absorption Spectra of Ti in Barium Titanates. Near the Curie Point for $BaTiO_3$," by M. N. Bril, Odessa State Pedagogical Institute imeni Ushinskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 3, Mar 60, pp 535-537

An experimental study had been carried out of the fine structure of the X-ray K-edge of the absorption spectrum of the monotitanate at room temperature. This spectrum was shown to differ essentially from that of the tetratitanate and is related to the crystalline structure of the compound and to the state of polarization of its atoms. The results from the present investigation confirmed the essential difference of the fine structure of X-ray absorption of Ti in barium titanates with various ratios of BaO and TiO_2.

184. Einsteinian Theory of Gravitation

"Comparison of Different Coordinate Conditions in the Einsteinian Gravitation Theory," by V. A. Fok, Leningrad State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 108-115

It is shown that the first approximation coordinate conditions actually used by Einstein and Infeld in the problem of mass motion coincide with the harmonic ones and determine the coordinate system in the approximation in question apart from a Lorentz transformation. The difference between the Einstein-Infeld coordinate system and the harmonic one is characterized by the order of smallness of admissible non-Lorentz transformations. These differences can be found in explicit form. They are so small that they cannot influence the form of the equations of motion in the first post-Newtonian approximation. On the basis of the results obtained, the general attitude of Einstein and Infeld in the coordinate problem is criticized.

185. Statistical Quantum Electrodynamics

"Some General Relations in Statistical Quantum Electrodynamics," by Ye. S. Fradkin, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 157-160

A number of general relations connected with the gauge invariance of statistical quantum electrodynamics has been obtained.

186. Galvanometric Characteristics of Metals

"Galvanometric Characteristics of Metals With Open Fermi Surfaces. II," by I. M. Lifshits and V. G. Peschanskiy, Physicotechnical Institute, Academy of Sciences Ukrainian SSR, Kharkov State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 188-193

On the basis of an earlier developed theory of galvanomagnetic phenomena, detailed calculations have been carried out for certain concrete types of Fermi surfaces, a particular case of which is, for example, the open surface constructed for copper by Pippard. It is shown that the

stereographic projection of resistances obtained for an open surface of this type is in good agreement with the experimental data for gold. The peculiarities of galvanomagnetic phenomena for a surface of the "corrugated plane" type have been studied. The possibility of a new type of angular singularities has been indicated, connected with the sharp change in direction of the open trajectories on approaching the field direction perpendicular to the "corrugated plane." Possibilities are discussed of a more complete reconstruction of the energy spectrum out of the galvanomagnetic characteristics of a metal.

187. Oscillations in Rotating He II

"The Damping of Disk Oscillations in Rotating Helium II," by Yu. G. Mamaladze and S. G. Matinyan, Physics Institute, Academy of Sciences Georgian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 184-187

The interaction of an oscillating disc with rotating helium II is examined. An expression has been obtained for the torsional moment acting on the disc surface, taking into account the presence of vortex lines, mutual friction between the normal and superfluid components, and the possibility of sliding of the vortex lines along the solid surface. Computation of the oscillation damping, neglecting sliding and in linear approximation with respect to the mutual friction coefficients, agrees qualitatively with experimental data. Apparently, quantitative agreement can be obtained only if sliding is taken into account.

188. Green's Function of Photons

"Concerning the Structure of Green's Function of a Photon," by D. A. Kirzhnits, V. Ya. Faynberg, and Ye. S. Fradkin, Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 1, Jan 60, pp 239-242

It is shown that the so-called Redmond procedure is not unambiguous. This conclusion does not change when the requirements of renormalization invariance are taken into account.

189. Second Work by Rother on Theory of Diffusion Waves

"Theory of Diffusion Waves. II. Amplification Conditions in Low Pressure Discharges," by H. Rother, Physical-Technical Institute of the German Academy of Sciences, Berlin W8; Leipzig, Annalen der Physik, Vol 5, No 5/6, 1960 pp 252-267

Within the framework of a previously (Ann. Physik (7), 4, 373, 1959) developed theory, it is shown that diffusion-induced amplification processes (moving layers of charge, etc.) in gas discharges occur only in current ranges in which carrier production or wall losses no longer increase in proportion to the electron concentration. Such variations of carrier production are possible if stepwise ionization makes up an appreciable portion of the carrier balance and if no saturation or concentration of excited atoms has occurred. In agreement with experimental findings, the current intensity ranges involved were found to be between about one milliampere and about 10 amperes, according to the type and pressure of the gas. At very low current intensities (below one milliampere), moving layers of charge appear as soon as the subnormal discharge form is realized. At high pressures, no diffusion-induced amplification processes exist if only electrons and positive ions play the dominant role in the carrier balance.

190. Soviets Develop Antidrought Spray

"Medicine Against Drought" (unsigned article); Sofia, Rabotnichesko Delo, 6 Mar 60, p 5

Recently, a "medicine" against drought was discovered at the Moscow Institute of Plant Physiology.

The investigations of Soviet scientists showed that as a result of the decomposition of cell proteins in the plant organism, ammonia is released. Usually this is neutralized by acids which are also formed by plant cells. But during a drought, the ammonia is separated so intensively that the plants themselves are not in a position to prevent this. They dry up and gradually wither.

Having arrived at this conclusion, Soviet scientists decided to help the plants restore normal metabolism by external means. The plants were sprinkled with a solution of ammonium nitrate. It has been found that vegetable crops, forrage grasses, and grains easily endure many days of hot weather, even from 40-50 degrees [C], and that their yields are doubled or tripled.

Soon this preparation will be widely applied in the southern regions in the Soviet Union which is deficient in moisture, to help increase the yields of agricultural crops.

191. English-Language Publication on Mechanics Published by the Polish Academy of Sciences

"New Journal on Mechanics," by O. O. Goroshko; Kiev, Prikladna Mekhanika, Vol 6, No 1, 1960, p 115

In 1959, the Institute of Fundamental Problems of Engineering of the Polish Academy of Sciences began publishing a new journal in the English language called "Proceedings of Vibration Problems." The journal, issued 4 times per year, will be devoted to problems of dynamics, questions concerning acoustical, electrical, and mechanical vibrations, and questions concerning the theory of mechanico-thermo-magnitoelectrical fields. Prof I. Maletskiy is the chief editor.

192. French Scientists Elected to Academy of Sciences USSR

"Louis de Broglie, Member of the Academy of Sciences USSR" (unsigned article); Paris, L'Humanite, 5 Feb 60, p 1

During a ceremony which took place on 4 March at the Soviet Embassy in Paris, Sergey Vinogradov, Soviet ambassador to France, presented diplomas designating the following French scientists as foreign members of the Academy of Sciences USSR: Louis de Broglie, life secretary of the French Academy of Sciences; Jacques Hadamard, mathematician, member of the Academy of Sciences; Louis Massignon, historian and expert on the Orient; Louis Neel, director of the Ecole Nationale d'Electrotechnique [National Electrotechnical School] of Grenoble; and Andre Mazon, professor of Slavic language and literature.

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